UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

REFERENCES

Adiwidjaja, P., de Coster, G.L., 1973. Pre-tertiary paleotopography and related sedimentation in South Sumatera. Proceedings Indonesian Petroleum Association 2nd Annual Convention, Jakarta, pp. 89- 103.

Alexeev AD, Vasilenko TA, Ulyanova EV, 1999. Closed porosity in fossil coals. Fuel 78(6):635–638.

Altindag R., 2012. "Correlation between P-wave velocity and some mechanical properties for sedimentary rocks", J. S. Afr. Inst. Min. Metall., Vol. 112, n.3, Johannesburg.

Amijaya, H. & Littke, R., 2005. Paleoenvironmental, paleoecological and thermal metamorphism implications on the organic petrography and organic geochemistry of Tertiary Tanjung Enim coal, South Sumatera Basin, Indonesia. Fakultät für Georessourcen und Materialtechnik, PhD (September), p.171.

Amijaya, H., Littke, R., 2005. Microfacies and flow environment of Tertiary Tanjung Enim low rank coal, South Sumatera Basin, Indonesia. International Journal of Coal Geology 61 (3/4), 197- 221.

Amijaya, H., Schwarzbauer, J., Littke, R., 2006. Organic geochemistry of the Lower Suban coal seam, South Sumatera Basin, Indonesia: palaeoecological and thermal metamorphism implications. Organic Geochemistry 37, 261–279. Anna, L.O., 2003. Groundwater flow associated with coalbed gas production, Ferron Sandstone, east-central Utah. International Journal of Coal Geology 56, 69–95.

Aminian, K., Rodvelt, G.,2014.Chapter 4 – Evaluation of Coalbed Methane Reservoirs, in Thakur P., Schatzel S. and Aminian K. (Eds) .Coalbed Methane, Elsevier, Oxford, 63-91.

Ammosov, I.I., Eremin, I.V., 1963. Fracturing in coal, IZDAT Publishers, Moscow. Office of Technical Services, Washington, DC, 109 pp.

Anggara, F., Sasaki, K., Rodrigues, S., Sugai, Y., 2014. The effect of megascopic texture on swelling of a low rank coal in supercritical carbon dioxide. International Journal of Coal Geology 125, 45-56.

Anggara F, Sasaki K, Amijaya H, Sugai Y, Setijadji L.D.,2010. CO_2 injection in coal seams, an option for geological CO_2 storage and enhanced coalbed methane recovery (ECBM).

Anggara, F. et.al. 2015. Numerical modelling and simulation of CO_2 enhanced. Coalbed methane (CO_2-ECBMR): The effect of coal swelling on gas production Performance. Journal SE Asian Appl. Geol : Vol 7(2) pp. 102-111.

APBI- ICMA. "Indonesian Coal Book 2006/2007", Indonesian Coal Mining Association.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Arso S., 2011, Kandungan Gas Metana Batubara Daerah Nibung, Kabupaten Musi Rawas, Provinsi Sumatera Selatan. Bandung. Pusat Sumber Daya Geologi Vol 6 No 1.

Asmina A, Sutriyono E, Hastuti E.W., 2016. Gas Content Appraisal of Shallow Coal Seams in The South Palembang Basin of South Sumatera. International Journal of GEOMATE, May, 2017, Vol.12, Issue 33, pp. 45-52 Geotec. Const. Mat. & Env., ISSN:2186-2990, Japan, DOI: http://dx.doi.org/10.21660/2017.33.2519

Ates, Y., Barron, K., 1988. The effect of gas sorption on the strength of coal. Min. Sci. Technol. 6, 291–300.

Ayers, W.B., Jr., 2002. Coalbed gas systems, resources and production and a review of contrasting cases from the San Juan and Powder River Basins: American Association of Petroleum Geologists Bulletin, v. 86, no. 11, p. 1853–1890.

Aziz NI, Ming-Li W. 1999. The effect of sorbed gas on the strength of coal – an experimental study. Geotech Geol Eng; 17(3–4):387–402.

Bagga, P., Roy, D.G., Singh, T.N., 2015. Effect of carbon dioxide sequestration on the mechanical properties of Indian coal. ISRM Regional Symposium-EUROCK 2015. International Society for Rock Mechanics (Paper no. 190).

Barenblatt GE, Zheltov IP, Kochina IN, 1960 Basic concepts in the theory of homogeneous liquids in fissured rocks. J Appl Math Mech;24:1286–303.

Belkin, H.E., Tewalt, S.J., Hower, J.C., Stucker, J.D., and O'Keefe, J.M.K. 2009. Geochemistry of selected coal sample from Sumatera, Kalimantan, Sulawesi, and Papua, Indonesia: International Journal of Coal Geology 77, pp. 260-268.

Berkowitz N, Schein HG. 1952. Some aspects of the ultrafine structure of lignites. Fuel;31:19–32.

Bhatia, S.K.,1987. "Modelling the Pore Structure of Coal", A.I.Ch.E.J., 33, 1707.

Bieniawski, Z.T., 1967. Mechanism of brittle rock fracture. Part I. Theory of the fracture process. International Journal of Rock Mechanics and Mining Sciences & Geomechanical Abstracts, 4(4):395-406.

Bishop M. G., 2000. South Sumatera Basin Province, Indonesia: The Lahat/Talang Akar-Cenozoic Total Petroleum System, U.S. Department of The Interior U.S. Geological Survey, http://geology.cr.usgs.gov/energy/WorldEnergy/OF99-50S/province.html (accessed 27 Dec 2006).

Black, D.J., 2013. Cyclic inert gas injection - an alternative approach to stimulate gas drainage from tight coal zones, in Proceedings of the 13th Underground Coal Operator's Conference, COAL 2013. University of Wollongong, 14-15 February, pp 292-199.

Boyd, J.D., Peacock, S.G., 1986. Sedimentological analysis of a Miocene deltaic system: Air Benakat and Muara Enim Formations, Central Merangin Block, South Sumatera.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Proceedings Indonesian Petroleum Association 15th Annual Convention, Jakarta, pp. 245-258.

Brace W.F. et.al.,1966. Dilatancy in the Fracture of Crystalline Rocks, Journal Of Geophysical Research vol. 71, No. 16 August 15, 1966, Department of Geology and Geophysics Massachusetts Institute of Technology, Cambridge.

Bustin. R.M., Cameron, A., Grieve. D. & Kalkreuth, W. 1985. Coal Petrology, Its Principles, Methods and Applications. Geological Association of Canada. Short Course Notes, 2nd edn.

Cai, Y et.al.,2014. Permeability evolution in fractured coal combining triaxial confinement with X-ray computed tomography, acoustic emission and ultrasonic techniques, International Journal of Coal Geology 122 (2014) 91–104.

Candra A, 2013. Potential Evaluation of Coalbed Methane based on The Grade and Quantity of The Coal in The Mangus Seam, Muaraenim Formation, Nibung Region, South Sumatera Basin. Proceedings Indonesian Petroleum Association, Thirty-Seventh Annual Convention & Exhibition, May 2013. IPA13-SG-051.

Carman, 1937. Fluid flow through granular beds. Chemical Engineering Research & Design: Transactions of the Institution of Chemical Engineers Part A. 15:415-421.

Carmichael, R.S. ed., 1982. Handbook of Physical Properties of Rocks, Vol. 2, 1-228. Boca Raton, Florida: CRC Press Inc.

Chikatamarla, L., X. Cui, and R. M. Bustin, 2004. Implications of volumetric swelling shrinkage of coal in sequestration of acid gases, paper 0435 presented at the 2004 International Coalbed Methane Symposium, Univ. of Ala., Tuscaloosa, 3 – 7 May.

Clarkson, C.R., Bustin, R.M., 1996. Variation in micro pore capacity and size distribution with composition in bituminous coal of the Western Canadian Sedimentary Basin. Fuel 75, 1483–1498.

Clarkson, C.R., Bustin, R.M.,1997. The Effect of Pore Structure and Gas Pressure upon the Transport Properties of Coal: a Laboratory and Modelling Study. 1. Isotherms and Pore Volume Distributions, Fuel, 78, 1333.

Clarkson, C.R., Jordan, C.L., Gierhart, R.R., Seidle, J.P., 2008. Production data analysis of coalbed–methane wells. SPE Reservoir Evaluation Engineering 311–325.

Close J. C. and Mavor, M.J., 1991. Influence of coal composition and rank on fracture development in Fruitland coal gas reservoirs of San Juan Basin. In: Schwochow, S., Murray, D.K., and Fahy, M.F. (Eds.), Coalbed Methane of Western North America. Rk.Mt. Association Geological Field Conference (1991), p.109-121.

Close, J.C., 1993. Natural fractures in coal. In: Law, B.E., Rice, D.D. (Eds.), Hydrocarbons from Coal. American Association of Petroleum Geologists, Tulsa, Oklahoma, pp. 119–132.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

CMG, 2010. User's Guide, GEM: Advanced Compositional and GHG Reservoir Simulator, Version 2010. Computer Modeling Group, Ltd, Calgary, Alberta, Canada. Included with release 2010.10.

Connell, L.D., Detournay, C., 2009. Coupled flow and geomechanical processes during enhanced coal seam methane recovery through CO_2 sequestration. International Journal of Coal Geology 77, 222–233.

Crosdale PJ, Basil Beamish B, Valix M. Coalbed methane sorption related to coal composition. Int J Coal Geol 1998;35(1–4):147–58.

Cui, X., Bustin, R.M., 2005. Volumetric strain associated with methane desorption and its impact on coalbed gas production from deep coal seams, The American Association of Petroleum Geologists. Bulletin 89 (9), 1181–1202.

Curtis O. Geologic carbon sequestration: CO_2 transport in depleted gas reservoirs. In: Gas Transp Porous Media. Netherlands: Springer; 2006.

Cuss R, Harrington J, Graham C, and Noy D. 2014. Observations of pore pressure in clay-rich materials; implications for the concept of effective stress applied to unconventional hydrocarbons. European Geosciences Union General Assembly. Energy Procedia 59 (2014) 59 – 66.

Czaplinski A, Gustkiewicz J, Holda S. 1982.An apparatus for investigation of changes of stresses and strains of rock samples under sorption. Archiwum Gornictwa, Archiv Mining Sci 1986;31(4:703–16. Czaplinski A, Holda S. Changes in mechanical properties of coal due to sorption of carbon dioxide vapour. Fuel; 61:1281–2.

Czaplinski A, Gustkiewicz J, Holda S. 1986.An apparatus for investigation of changes of stresses and strains of rock samples under sorption. Archiwum Gornictwa, Archiv Mining Sci 1986;31(4):703–16.

Czaplinski A, Gustkiewicz J. 1990. Sorption stresses and deformations in coal. Strata Multiphase Medium;2:455–68.

Czapliński, A. & Hołda, S., 1982. Changes in mechanical properties of coal due to sorption of carbon dioxide vapour. Fuel, 61(12), pp.1281–1282.

Daly, M.C., Hooper, B.G.D., Smith, D.G., 1987. Tertiary plate tectonics and basin evolution in Indonesia. Proceedings of Indonesian Petroleum Association, 16th Annual Convention, pp. 399–428.

Darman, H., Sidi, F.H., 2000. An Outline of the Geology of Indonesia. Indonesian Association of Geologists, Jakarta. Published by the. 254 p.

Daulay, B. and Cook, A.C., 1988. The Petrology of some Indonesian coals. Journal of Southeast Asian Earth Sci., 2, pp. 45-64.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Daulay, B., 1985. Petrology of some Indonesian and Australian Tertiary coals. MSc (Hons) Thesis, the University of Wollongong, Wollongong, 265 p.

Dawson, G.K.W., Esterle, J.S. (2010). Controls on coal cleat spacing. International Journal of Coal Geology, 82, 213-218.

Day S, Fry R, Sakurovs R, Weir S. 2010. Swelling of coals by supercritical gases and its relationship to sorption. Energy & Fuels; 24(4):2777e83.

De Coster, G.L., 1974. The geology of the Central and South Sumatera Basins. Proceedings Indonesian Petroleum Association, 3th Annual Convention, 77-110.

Deisman, N., Gentzis, T., Chalaturnyk, R.J., 2008. Unconventional geomechanical testing on coal for coalbed reservoir well design: the Alberta Foothills and Plains. International Journal of Coal Geology 75, 15–26.

Diessel, C.F.K.1992: Coal Bearing Development. Springer-Verlag Berlin Heidelberg, 1 -721.

Dollimore, D. & Heal, G.R., 1961. The effect of various vapors on the strength of compacted silica. J. Appl. Chem., 11, pp.459–463.

Dron RW, 1925.Notes on cleat in the Scottish coalfield. Trans Inst Min Eng ;70:115–7.

Durucan, S., Edwards, J.S.,1986. The effects of stress and fracturing on permeability of coal. Mining science and technology. 3, 205-216

Eberhardt, E., 1998: Brittle rock fracture and progressive damage in uniaxial compression Ph.D. thesis, Department of Geological Sciences, University of Saskatchewan, Saskatoon.

Esterhuizen, G.S., 1995. Rock engineering evaluation of jointing in South African coal seams and its potential effect on coal pillar strength. In: Rossmanith, H.-P. Ed, Mechanics of Faulted and Jointed Rock.

Ettinger IL, Lamba EG.1957. Gas medium in coal-breaking processes. Fuel; 36:298–306.

Flores, R.M., 2004, Coal buildup in tide-influenced coastal plains in the Eocene Kapuni Group, Taranaki Basin, New Zealand, in J.C. Pashin and R.A. Gastaldo, eds., Sequence stratigraphy, paleoclimate, and tectonics of coal-bearing strata: AAPG Studies in Geology 51, p. 45-70.

Flores, R.M., 2001, Upper Cretaceous Tertiary Total Petroleum System on coalbed methane in the Powder River Basin, Montana and Wyoming: U.S. Geological Survey , DDS 69c.

Flores, 2014. Coal and Coalbed Gas: Fueling the Future, Elsevier, Romeo M. Flores, Washington DC, 2014.

Friederich, M.C., Langford, R.P., Moore, T.A., 1999. The geological setting of Indonesian coal deposits. The AusIMM Proceedings 304, 23–29

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Friederich, M.C., Moore, T.A., Lin, M.S.W., Langford, R.P., 1995. Constraints on coal formation in Southeast Kalimantan, Indonesia. Proceedings 6th New Zealand Coal Conference, pp. 137–149.

Fujioka, M., S. Yamaguchi and M. Nako, 2010. CO_2-ECBM field tests in the Ishikari Coal Basin of Japan. Int. J. Coal Geol., 82: 287-298.

Gafoer, S., Cobrie, T. and Purnomo, J., 1986. Geological map of the Lahat Qua South Sumatera, Geological Research and Development Centre, Bandung, Indonesia. 10pp.

Gale J, Freund P. 2001. Coal-bed methane enhancement with CO_2 sequestration world- wide potential. Environmental Geosciences;8(3):210e7.

Gamson PD, Beamish BB, Johnson DP., 1993.Coal microstructure and micro permeability and their effects on natural gas recovery. Fuel;72:87–99.

Gas Research Institute. A guide to coalbed methane reservoir engineering. Chicago; 1996.

Geilikman, M.B., and Sau-Wai Wong, 2008, Production Decline in Petroleum Reservoirs Influence of Rock Parameters: Proceedings of 12th International Conference of International Association for Computer Methods and Advances in Geomechanics (IACMAG) 1-6 October, 2008, Goa, India.

Gentzis, T., Deisman, N., Chalaturnyk, R. J. 2007. Geomechanical properties and permeability of coals from the Foothills and Mountain regions of western Canada. International Journal of Coal Geology. 69 (2007) 153–164.

Geological Survey Indonesia, 1978. Geological study of the coal reserves and quality of Bukit Asam Coalmines. Departemen Pertambangan Perusahaan Negara Tambang Batubara. 132pp

Gibbs, J.W. 1878.On the equilibrium of heterogeneous substances. Am. J. Sci., 16, 441–458.

Gibson P, Catherine M, Svendsen L, Underschultz J, Watson MN, Ennis KJ, et.al.,. 2006. Gippsland basin geo-sequestration: a potential solution for the Latrobe Valley brown coal CO_2 emissions. APPEA J;46(1):413–33.

Gilman, A. and Beckie, R..,2000. Flow of coal-bed methane to a gallery. Transport in Porous Media, 41, 1-16.

Gilman, J. R. and Kazemi, H., 1988.Improved Calculations for Viscous and Gravity Displacement in Matrix Blocks in Dual-Porosity Simulators. SPE Journal of Petroleum Technology, (1) .SPE 16010, includes associated papers (17851, 17921, 18017, 18018, 18939, 19038, 19361 and 20174).

Gluskoter HJ, Stanton RW, Flores RM, Warwick PD. Adsorption of carbon dioxide and methane in low-rank coals and the potential for sequestration of carbon dioxide. Environ Geosci 2002;9:160–161.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Goodman, A.L., et.al.,.2004, An inter-laboratory comparison of CO_2 isotherms measured on Argonne Premium Coal samples. Energy & Fuels, 2004. 18: p. 1175-1182.

Golding S. D., Uysal I. T., Boreham C. J., Kirste D., Baublys K. A., and Esterle J. S.,2010. "Adsorption and mineral trapping dominate CO_2 storage in coal systems," in Proceedings of the 10th International Conference on Greenhouse Gas Control Technologies, vol. 4, pp. 3131–3138.

Gray, 1987. Reservoir engineering in coal seams: Part 1 – the physical process of gas storage and movement in coal seams. SPE Reservoir engineering. February 1987, 28-34 (1987).

Gregg SJ, Sing KSW. Adsorption surface area and porosity. USA: Academic Press; 1982.

Griffith, A.A.1921. The phenomena of rupture and flow in solids. Philos. Trans. R. Soc. Lond. A, 221, 163–198.

Gu, F., Chalaturnyk, R., 2010. Permeability and porosity models considering anisotropy and discontinuity of coalbeds and application in coupled simulation. J. Petrol. Sci. Eng. 74, 113e131

Gu, F., Chalaturnyk, R.J., 2005. Analysis of coalbed methane production by reservoir and geomechanical coupling aimulation. Journal of Canadian Petroleum Technology, 44(10), 33-42.

Gunter, W.D., Gentzis, T., Rottenfusser, B.A., and Richardson, R.J.H.1997.Deep coalbed methane in Alberta, Canada: a fuel source with the potential of zero greenhouse gas emissions, Energy Convers. Mgmt. 38,(Supplement 1, S217-S222.

Gürdal G. and Yalçın M.N. (2001). Pore volume and surface area of the Carboniferous coals from the Zonguldak basin (NW Turkey) and their variations with rank and maceral composition. International Journal of Coal Geology, 48, 1-2, 133-144.

Gustkiewicz J, Orengo Y. Behavior of coal caused by water or carbon dioxide. In: Adv Rock Mech. World Scientific Publishing Co Singapore; 1998. p. 18–27.

Haan, E.J., 1976. Stratigraphy and structure of the coal deposits surrounding the Taba concession, South Sumatera. Shell Mijnbouw NV, Jakarta (unpublished).

Hadiyanto and Stevens, S.H., 2005, Coalbed Methane Prospects in Lower Rank Coals of Indonesia, IAGI Special Issues 2005.

Hall PJ, Thomas KM, Marsh H.,1992.nan The relation between coal macromolecular structure and solvent diffusion mechanisms. Fuel 71(11):1271–1275.

Halliburton, 2008. Coalbed_Methane_Principles_and_Practices. http://www.halliburton.com/public/pe/contents/Books_and_Catalogs.

Hanes J, Shepherd J. 1981. Mining induced cleavage, cleats and instantaneous outbursts in the Gemini seam at Leichhardt Colliery, Blackwater, Queensland. Proc Aust Inst Min Metall;277:17–26

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Harpalani S, Chen G. 1997. Influence of gas production induced volumetric strain on permeability of coal. Geotech Geol Eng 1997; 15:303–25.

Harpalani S, Chen G. Influence of gas production induced volumetric strain on permeability of coal. Geotech Geol Eng 1997;15:303–25.

Harpalani S, Schraufnagel RA, 1990. Shrinkage of coal matrix with release of gas and its impact on permeability of coal. Fuel;69:551–6.

Harpalani S. Gas flow characterization of Illinois coal. Final Technical Report; 2005.

Heriawan, M. N., and Koike, K.: Coal quality related to microfractures identified by CT image analysis, International Journal of Coal Geology, 140, 97-110, doi:10.1016/j.coal.2015.02.001, 2015.

Hermiyanto M.H. and Setiawan R.,2010. Coalbed Methane Potential and Coal Characteristics in Muara Lakitan Area, South Sumatera**.** Geo-Resources Journal. JSDG Vol 20. No.3.

Herning F., Zipperer L., 1936. Calculation of the viscosity of technical gas mixtures from the
Hiramatsu, Y., Saito, T. and Oda, N. (1983). Studies on mechanism of gas and coal burst in
Hol, S., Spiers, C.J., 2012. Competition between adsorption-induced swelling and elastic compression of coal at CO_2 pressures up to 100 MPa. J. Mech. Phys. Solids 60, 1862–1882.

Holda, S (1986). Investigation of adsorption, dilatometry and strength of low rank coal, Archiwum Gornictwa, Tom, Vol. 31, pp. 599-608

International Energy Outlook , 2016. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=2IEO2016&sourcekey=0.

International Union of Pure and Applied Chemistry (IUPAC). Manuals of symbols and terminology for physico chemical quantities and units. Butterworth; 1972.

Intergovernmental Panel on Climate Change, 2015, https://www.netl.doe.gov/publications/proceedings/05/carbon-seq/Plenary%20Coninck.pdf

Itasca Consulting Group Inc. 2002.. FLAC3D Manual: isothermal and compositional reservoir simulator and the geomechanical code FLAC3D; version 2.0. Minnepolis.

Jackson, L. J. 1984. Outbursts in coal mines, IEA coal research, London, Report No. ICTIS/TR25

Japanese coalmine, Internationa congress on Rock Mechanics, Melbourne, pp. 7-10.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

JRC Science for Policy Report, 2017.https://ec.europa.eu/jrc/en/publication/annual-reports/jrc-annual-report-2017.

Jasinge, D., 2010. An Investigation of the Effect of Carbon Dioxide Sequestration on the Behaviour of Brown Coal (PhD thesis) Monash University, Melbourne, Australia.

Jeffrey RG, Enever JR, Wood JH, Connors JP, Choi SK, Meaney KTA, et.al.,. A stimulation and production experiment in a vertical coal seam gas drainage well. In: Proceedings of SPE Asia.

Jones AH, Bell GJ, Schraufngel RA, 1988. A review of the physical and mechanical properties of coal with implications for coalbed methane well completion and production: Coalbed Methane, San Juan Basin. Rocky Mountain Association of Geologists; p. 169–81.

Karacan, C.O., Okandan, E., 2000. Fracture/cleat analysis of coals from Zonguldak basin (northwestern Turkey) relative to the potential of coalbed methane production. International Journal of Coal Geology 44, 109–125.

Kendall PF, Briggs H. 1933. The formation of rock joints and the cleat of coal. Proc R Soc Edinburgh;53:164–87.

Kentucky Geological Survey, Online access, http://www.uky.edu/KGS.

Khandelwal, M., Singh, T.N., 2009. Correlating static properties of coal measures rocks with P-wave velocity. Int. J. Coal Geol. 79, 55–60. http://dx.doi.org/10.1016/j.coal. 2009.01.004.

Kim A.G., 1977. “Estimating methane content of bituminous coalbeds from adsorption data”, USBM, RI-8245, pp. 2 – 12.

King, G.R., Ertekin, T., Schwerer, F.C., 1986. Numerical simulation of the transient behavior of coal seam degasification wells. Society of Petroleum Engineers (SPE) Formation Evaluation 4, 165 183.

Kinhill Ottogold Joint Venture, 1986. South Sumatera coal exploration project - Banko Barat Feasibility Study. II Coal Resources. Directorate General of Mines. 79 pp.

Klinkenberg, L.J., 1941. The permeability of porous media to liquid and gases. Paper presented at the API 11th mid-year meeting, Tulsa. API Drilling and Production Practices, New York, pp. 200–213.

Koesoemadinata, R.P., 1978. Sedimentary framework of Tertiary coal basins i Third Regional Conference on Geology and Mineral Resources of South East As Bangkok, Thailand, 621-639

Koesoemadinata, R.P., Harjono, Usna, I. and Sumadirdja, H., 1977. Tertiary of Indonesia. United Nations ESCAP, CCOP Technical Bulletin, 12, 4

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Kolak, J.J., Burruss, R.C., 2006. Geochemical investigation of the potential for mobilizing non-methane hydrocarbons during carbon dioxide storage in deep coalbeds. Energy and Fuels 20 (2), 566–574.

Kovscek, A.R., Cakici, M.D., 2008. Geologic storage of carbon dioxide and enhanced oil recovery. II. Cooptimization of storage and recovery. Energy Convers. Man- age. 46, 1941–1956.

Kronimus, A. et.al.,2008. A preliminary evaluation of the CO_2 storage potential in unminable coal seams of the Münster Cretaceous Basin, Germany. International Journal of Greenhouse Gas Control, 2(3), pp.329–341.

Kross B.M., Bergen F.van, Gensterblum Y., Siemons N., Pagnier H.J.M. and David P., 2002. High-pressure methane and carbon dioxide adsorption on dry and moisture equilibrated Pensylvanian coals. Int. J. Coal Geol., 51, 69-92.

Kulander, B.R., Dean, S.L., 1993. Coal-cleat domains and domain boundaries in the Allegheny Plateau of West Virginia. AAPG Bulletin 77, 1374–1388.

Kurnely, K., Tamtomo, B., Aprilian, S., and Doria, I., 2003. A Preliminary Study of Development of Coal- bed Methane (CBM) in South Sumatera. Paper SPE 80518, 5 p.,http://www.msitest.info/pertaminaep/downloadan/repository/spe-80518 cbm.pdf.

Lal, R. and Steward, BA. 1992. Soil restoration. V-17 Advances in Soil Science, Springer.

Lal, R., Follett, F., Stewart, B.A. & Kimble, J.M. 2007. Soil carbon sequestration to mitigate climate change and advance food security. Soil Sci., 172: 943–956.

Larsen, J.W., 2004. The effects of dissolved CO_2 on coal structure and properties. Int. J. Coal Geol. 57 (1), 63e70.

Larsen, J.W., Flowers, R.A., Hall, P.J., Carlson, G., 1997. Structural rearrangement of strained coals. Energy Fuels 11, 998–1002.

Latham S., Varslot T. & Sheppard A. 2008. Image registration: Enhancing and calibrating X-ray micro-CT imaging. In: Proceedings of the International Symposium of the Society of Core Analysts. SCA2008-35. Abu Dhabi, United Arab Emirates.

Laubach SE, Marrett RA, Olson JE, Scott AR.,1998. Characteristics and origins of coal cleat: a review. International Journal of Coal Geology 1998;35(1e4):175e207.

Laubach SE, Tremain CM., 1991. Regional coal fracture patterns and coalbed methane development. In: Roegiers J-C, editor. Proc 32nd US Symp Rock Mech Balkema Rotterdam. p. 851–9.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Law, B.E., 1993. The relationship between coal rank and cleat spacing: implications for the prediction of permeability in coal. 1993 International Coalbed Methane Symposium, The University of Alabama, Tuscaloosa, Alabama (USA), pp. 435–441.

Law D,Van der Meer L.Numerical simulator comparison study for enhanced coalbed methane recovery processes, part I:Pure carbon dioxide injection. In: SPE Gas technology symposium.

Levy, J., and Saghafi, A.,2005. "CSIRO Volumetric method of Gas Adsorption Measurement",, CSIRO Energy, Newcastle Australia.

Liu, H.-H., Rutqvist, J., Berryman, J.G., 2009. On the relationship between stress and elastic strain for porous and fractured rock. International Journal of Rock Mechanics and Mining Sciences 46, 289–296.

Liu, J., Chen, Z., Elsworth, D., Qu, H., Chen, D., 2011. Interactions of multiple processes during CBM extraction: a critical review. International Journal of Coal Geology 87, 175–189.

Lu M, Connell LD. 2006.A multi-component dual-porosity model for gas reservoir flow with adsorption behavior. In: SPE Asia Pacific Oil & Gas Conference and Exhibition, Adelaide, Australia; 2005.

Lu, M., Connell, L.D., 2007. A model for the flow of gas mixtures in adsorption dominated dual porosity reservoirs incorporating multi-component matrix diffusion: part I. Theoretical development. J. Pet. Sci. Eng. 59 (1–2), 17–26.

Lu, T.K., Yu, H., Zhou, T.Y., et. al., 2009. Improvement of methane drainage in high gassy coal seam using waterjet technique. International Journal of Coal Geology. 79, 40-48.

Lucia, F.J. 1983: "Petropyhysical Parameters Estimated from Visual Descriptions of Carbonate Rocks: A Field Classification of Carbonate Pore Space," JPT (March 1983) 629; Trans., AIME, 275.

Ma, Q., Harpalani, S., Liu, S., 2011. A simplified permeability model for coalbed methane reservoirs based on matchstick strain and constant volume theory. International Journal of Coal Geology, 85(1), 43-48.

Mahajan OP (1991) CO_2 surface area of coals: the 25-year paradox. Carbon 29(6):735–742.

Majewska, Z., Zietek, J., 2007. Changes of acoustic emission and strain in hard coal during gas sorption–desorption cycles. International Journal of Coal Geology.

Mandal, D., Tewari, D.C., Rautela, M.S., 2004. Analysis of Micro-fractures in Coal for Coalbed Methane Exploitation in Jharia Coal Field. 5th Conference and Exposition on Petroleum Geophysics, Hyderabad, India, Jan. 15–17. 904–909.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Manoj Khandelwal and P.G. Ranjith, 2010 "Correlating index properties of rocks with P-wave measurements", Journal of Applied Geophysics, Vol. 71, pp. 1-5.

Marsh H, Siemieniewska T. 1965. The surface areas of coals as evaluated from the adsorption isotherms of carbon dioxide using the Dubinin-Polayni equation. Fuel;44:355–67.

Marsh, H., 1965. The Determination of Surface Areas of Coals - Some Physicochemical Considerations. Fuel 44, 253-268.

Martin, C.D., and Chandler, N.A. 1994. The progressive fracture of Lac du Bonnet granite. International Journal of Rock Mechanics and Mining Sciences & Geomechanical Abstracts, 31(6): 643–659.

Marzec A. Towards an understanding of the coal structure: a review. Fuel Processing Technology 2002; 77-78: 25 - 32.

Massarotto P., Golding S.D., Iyer R., Bae JS and Rudolph V., 2007. Adsorption, Porosity and Permeability Effects of CO_2 Geosequenstration in Permian Coals. 2007 International Coalbed Methane Symposium : 0727.

Maulana T. and Anggara F., 2016. Hubungan sistem cleat dengan permeabilitas batubara peringkat rendah pada tambang Bangko Barat - Muara Enim Sumatera Selatan. Seminar Nasional Kebumian Ke-9. October 6-7 2016. Yogyakarta.

Mavor MJ, Gunter WD, Robinson JR, Law DHS, Gale J. Testing for CO_2 sequestration and enhanced methane production from coal. In: Spe Gas Technol Symp.

Mavor MJ, Owen LB, Pratt TJ. 1990. Measurement and evaluation of coal isotherm data. In: The 65th annual technical conference and exhibition. Richardson, Texas, USA: The Society of Petroleum Engineers; p. 20728.

Mavor, M.J., Gunter, W.D., 2006. Secondary Porosity and Permeability of Coal vs. Gas Composition and Pressure. SPE Reservoir Evaluation Engineering 9, 114–125.

Mavor, M.J., Owen, L.B., Pratt, T.J. 1997. Measurement and evaluation of coal sorption isotherm data. Paper SPE 20728 presented at the SPE Annual Technical Conference and Exhibition, NewOrleans, LA 23–26 Sept.

Maylotte, D.H., Spiro, C.L., Kosky, P.G., et.al.,1986. Application of X-ray computed tomography to coal studies. Am. Chem. Soc. 29, 44–54.

Mazumder, S., Wolf, K.-H.A.A., Elewaut, K., and Ephraim, R., 2006. Application of X- ray computed tomography for analyzing cleat spacing and cleat aperture in coal samples. International Journal of Coal Geology, 68, p.205-222.

Mastalerz, M., Drobniak, A., Schimmelmann, A., 2009. Changes in optical properties, chemistry, and micro pore and mesopore characteristics of bituminous coal at the contact with dikes in the Illinois Basin. International Journal of Coal Geology 77, 310–319.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Mckee, C.R., Bumb, A.C., 1988. A three-dimensional analytical model to aid in selecting monitoring locations in the vadose zone. Ground Water Monit. Rev. 8(2), 124–136.

McNally, G H, 1987. Estimation of Coal Measures Rock Strength using Sonic and Neutron Logs, Geoexploration, 24:14.

MCS Consultant, 1987. Bukit Asam Coal Mining Development and Transportation Project. Milestone 6, Final Report for Phase I, Section 1. 2-1 to 2-8 and 3-9 to 3-28.

Medhurst, T.P.; Brown, E.T, 1998. A Study of the mechanics behavior of coal for pillar design. Int. J. Rock Mech. Mining Sci., , 35(8), 1087-1104.

Mehic, M., Ranjith, P.G., Choi, S.K., Haque, A., 2006. The geomechanical behavior of Australian black coal under the effects of CO_2 injection: uniaxial testing. Geotechnical Special Publication. American Society of Civil Engineers, Reston, VA 20191-4400, United States, Shanghai, China, pp. 290–297.

Meissner, Clayton JL. 1984. Hydrocarbon source rocks of the greater Rocky Mountain Region. Rocky Mountain Association of Geologists; p. 401–31.

Meng, Z., Zhang, J., Wang, R., 2011. In situ stress, pore pressure, and stress- dependent permeability in coalbed methane reservoirs. Int. J. Rock Mech. Min. Sci. 48, 122-131.

Meng, Z.P., Zhang, J.C., Joachim, T., 2006. Relationship between physical and mechanical parameters and acoustic wave velocity of coal measures rocks. Chin. J. Geophys. 49, 1505–1510 (in Chinese) methane, nitrogen, and carbon dioxide and their binary mixtures on wet Fruitland coal. SPE 29194-MS

Metcalfe,R.S. D. Seidle J.P and Puri 1991.Review of research efoorts on CBM in SPE 23025 Presented at SPE Asia Pacific, Perth, Nov 4-7.

Milewska-Duda J, Duda J, Nodzenski A, Lakatos J. Absorption and adsorption of methane and carbon dioxide in hard coal and active carbon. Langmuir 2000;16 (12):5458–66.

Milewska-Duda J., Duda J., Jodłowski G.S. & Kwiatkowski M., 2000. A model for multilayer adsorption in microporous materials. Langmuir, 16, 7294–7303.

Ministry of Energy and Mineral Resources of Indonesia,2017. https://www.esdm.go.id/en.

Moffat DH, Weale KE. 1955. Sorption by coal of methane at high pressure. Fuel;34:449–62.

Molinda GM, Mark C. Rating the strength of coal mine roof rocks. In: Proc 2nd North Am Rock Mech Symp Balkema, Rotterdam. p. 413–22.

Montemagno CD, Pyrak-Nolte LJ. Fracture network versus single fractures: Measurement of fracture geometry with X-ray tomography. J Phyisics and Chemistry of the Earth 1999; 24(7).

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Moore, T.A., 2012. Coalbed methane: a review. International Journal of Coal Geology, 101: 36-81.

Netherlands Environmental Assessment Agency,2017, http://www.pbl.nl/en/.

Nandi S.P. and Walker, Jr. P.L.,1965.The diffusion of nitrogen and carbon dioxide from coals of various rank. Fuel 44, 385-393.

Nie, B, Liu, X, Yuan, S.2016. Sorption characteristics of methane among various rank coals: Impact of moisture. Adsorption 22(3): 315–325.

NuEnergy, 2013. Muara Enim Pilot Well #2 Gas Flare and Permeability Results. ASX Announcement. ABN 50 009 126 238.

Nugrahanti, A., Fathaddin M.T, 2017. The Impact of Permeability and Well Spacing on Well Productivity In a Coalbed Reservoir. International Journal of Civil Engineering and Technology (IJCIET), Volume 8, Issue 11 Nov 2017, pp. 236–244.

Nugroho, W., Arsegianto, 1993. Future prospects of coalbed methane in Indonesia. Proceedings of the 1993 International Coalbed Methane Symposium, University of Alabama, Tuscaloosa, Alabama, USA, pp. 721–726.

Option for Geological CO_2 Storage and Enhanced Coalbed Methane Recovery (ECBM). Proceedings Indonesian Petroleum Association. 34th Annual Convention & Exhibition, May 2010.

Orowan, E., 1944. The fatigue of glass under stress. Nature, 154(3906), pp.341–343.

Oyler, D C, Mark, C and Molinda, G M, 2010. In situ estimation of roof rock strength using sonic logging, International Journal of Coal Geology, 83(4):484-490.

Ozdemir E, Schroeder K, and Morsi B.I., 2002. Adsorption Capacity of Carbon Dioxide on Argonne Premium Coals. Fuel Chemistry Division Preprints 2002, 47(1), 11.

Palmer ID, Vaziri H. Permeability changes in CBM reservoir during production: An update and implications for CO_2 injection. In: The 2004 international coalbed methane symposium technical sessions, Tuscaloosa; 2004. p. 3–7.

Palmer ID, Vaziri H. Permeability changes in CBM reservoir during production: An update and implications for CO_2 injection. In: The 2004 international coalbed methane symposium technical sessions, Tuscaloosa. p. 3–7.

Palmer L, Mansoori J. How permeability depends on stress and pore pressure in coalbeds: a new model. In: SPE annual technical conference and exhibition, Denver. p. 539–44.

Palmer L, Mansoori J., 1996. How permeability depends on stress and pore pressure in coalbeds: a new model. In: SPE annual technical conference and exhibition, Denver. p. 539–44.10.1190/1.1440465.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Pan, J.N.,Meng, Z.P.,Hou,Q.L., Ju, Y.W., Cao, Y.X., 2013. Coal strength and Young'smodulus related to coal rank, compressional velocity and maceral composition. J. Struct. Geol. 54, 129–135. http://dx.doi.org/10.1016/j.jsg.2013.07.008.

Patching TH, Mikhail MW, 1970. Studies of gas sorption and emission on Canadian coals. CIM Bull; 79(887):104–9.

Patching, T.H., 1965. Variations in permeability of coal. Proc. 3rd Rock Mech. Symp. Univ. of Toronto, U.K, pp. 185–199.

Paterson L, 1986. A model for outbursts in coal. International Journal of Rock Mechanics & Mining Sciences & Geomechanics Abstract, 23, 327-332.

Paterson, L., Meany, K., Smyth, M., 1992. Measurements of Relative Permeability, Absolute Permeability and Fracture Geometry in Coal. Coalbed Methane Symposium, Townsville, Queensland, Australia, November.

Pekot LJ, Reeves SR; 2002. Modeling coal matrix shrinkage and differential swelling with CO_2 injection for enhanced coalbed methane recovery and carbon sequestration applications. U.S. Department of Energy.

Perera, M.S.A., Ranjith, P.G., Airey, D., Choi, S.K., 2011a. Sub-critical and super-critical carbon dioxide flow behaviour in naturally fractured black coal: an experimental study. Fuel 90 (11), 3390e3397.

Perera, M.S.A., Ranjith, P.G., Choi, S.K., et.al.,2011. The effects of sub-critical and super-critical carbon dioxide adsorption-induced coal matrix swelling on the permeability of naturally fractured black coal. Energy, 36(11), pp.6442–6450. Available at: http://dx.doi.org/10.1016/j.energy.2011.09.023.

Perera, M.S.A.; Ranjith, P.G.; Viete, D.R., 2013 Effects of gaseous and super-critical carbon dioxide saturation on the mechanical properties of bituminous coal from the Southern Sydney Basin. Appl. Energy, 110, 73–81.

Permana A.K. and Panngabean H.,2011. Cleat characteristics in Tertiary Coal of The Muaraenim Formation - Bangko Area, South Sumatera Basin : Implication for Coalbed Gas Potential. Geo-Resources Journal. JSDG Vol 21. No.5.

Petukhov I, Akin'shin B, Mol'skii E. 1972. Physical nature of the burst proneness of brown coal seams. J Min Sci;8(3):246–9.

Puri, R., Evanoff, J.C., Brugler, M.L., 1991. Measurement of Coal Cleat Porosity and Relative Permeability Characteristics. SPE Gas Technology Symposium, Houston, Texas, SPE 21491, January.

Parkash, S., and Chakrabartty, S. K., 1986. Microporosity in Alberta Plains Coals:International Journal of Coal Geology, v. 6, pp 55-70.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Pratiwi R. Nugroho H, Widiarso D, Lesmana R.,2014. Structural Geology and Tectonism Influence in Predicting Coalbed Methane Potential of Seam Pangadang - A, in "DIPA" Field South Sumatera Basin. Proceedings Indonesian Petroleum Association, Thirty- Eighth Annual Convention & Exhibition, May 2014. IPA14-G-247

Preliminary investigation of biogenic gas production in Indonesian low rank coals and implications for a renewable energy source. Journal of Asian Earth Sciences 77, 234-242.

Pujobroto, A., 1997. Organic petrology and geochemistry of Bukit Asam coal, South Sumatera, Indonesia. Unpublished Ph.D. thesis, University of Wollongong, Australia, 397 pp.

Pulunggono, A., Agus, H.S., Kosuma, C.G., 1992. Pre-tertiary and tertiary fault systems as a framework of the South Sumatera Basin, a study of SAR maps. Proceedings Indonesian Petroleum Association, 21st Annual Convention, Jakarta, pp. 439–460.

Pyrak-Nolte, L.J., Montemagno, C.D. and Nolte, D., 1997, Volumetric imaging of aperture distributions in connected fracture networks, Geophys. Res. Lett., vol. 24, pp. 2343-2346.

Ranjith, P.G. & Perera, M.S.A., 2012. Effects of cleat performance on strength reduction of coal in CO_2 sequestration. Energy, 45(1), pp.1069–1075. Available at: http://dx.doi.org/10.1016/j.energy.2012.05.041.

Ranjith, P.G. et.al.,2010. The effect of CO_2 saturation on mechanical properties of Australian black coal using acoustic emission. Fuel, 89(8), pp.2110–2117. Available at: http://dx.doi.org/10.1016/j.fuel.2010.03.025.

Rebinder PA, Venstrem EK. The electro-capillary effect of reduction in hardness of metals. Zh Fiz Khim 1945; 19:1–14.

Rebinder, P. 1928, Influence of changes in the surface energy on cleavage, hardness, and other properties of crystals. In Proceedings of the Sixth Conference of Russian Physicists, Moscow, Russia.

Reeves SR. 2001 Geological sequestration of CO_2 in deep, unmineable coalbeds: an integrated research and commercial-scale field demonstration project. In: The 2001 SPE annual technical conference and exhibition. Richardson, Texas: The Society of Petroleum Engineers;. p. 71749.

Reucroft P.J. and Patel H. 1986, Gas Induced Swelling in Coal, Fuel, 65, pp. 816-820.

Reznik AA, Fulton PF, Lien CL. 1978. Measurement of the flow properties of coals for in situ gasification (As a function of water saturation and orientation). Progress Report COO-4639-3. USA: Pittsburgh University;

Robert L, Brusset H. 1965. Heat of immersion of carbon products. Fuel;44:309–16.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Robertson EP., 2005.Measurement and modeling of sorption-induced strain and permeability changes in coal. Idaho National Laboratory.

Robertson, E P and Christiansen, R L. 2008. A permeability model for coal and other fractured, Sorptive-elastic media, SPE Journal, 13 (03).

Rodrigues, C.F., Lemos de Sousa, M.J., 2002. The measurement of coal porosity with different gases. Int. J. Coal Geol. 48, 245–251.

Romanov V, Soong Y (2008) Long-term CO_2 sorption on upper freeport coal powder and lumps. Energy Fuels 22(2):1167–1169

Romanov V,2007. Coal chemistry for mechanical engineers: from macromolecular thermodynamics to reservoir simulation. Energy Fuels 21(3):1646–1654.

Romanov VN, Bong H.T, Fazio J. Howard B.,2013. Comparison of high-pressure CO_2 sorption isotherms on Eastern and Western US coals. U.S. Department of Energy, National Energy Technology Laboratory, Pittsburgh, PA 15236.

Ryan B, Mannhardt K, 2007. Diffusivity and diffusion coefficients of anthracite. University of Alabama, Tuscaloosa, Alabama.

Saghafi A., Faiz, M., D. Roberts, D., 2007, "CO_2 storage and gas diffusivity properties of coals.

Sakurovs, R., Day, S., Weir, S., 2010. Relationships between the critical properties of gases and their high pressure sorption behavior on coals. Energy & Fuels 24, 1781–1787.

Santarosa CS, Crandall D, Haljasmaa IV, Hur TB, Fazio JJ, Warzinski RP, Heemann R, Ketzerf JMM, Romanov VN (2013) CO_2 sequestration potential of Charqueadas coal field in Brazil. Int J Coal Geol 106:25–34.

Sappel, K.K. and Hariyanto, A., 2004, Geological setting and trace elements associations of Tertiary Kalimantan coal, Sebuku Island, Indonesia. Abstracts – Geological Society of Australia, vol. 73, p. 243.

Saragih, C., 1985. Mikropetrographische Untersuchungen an Braun-Kohlen Aus Der Bohrung GHL7 - Bukit Asam, Sumatera Indonesien. Diplomarbeit RWTH - Aachen, 56pp.

Saulsberry JL, Schafer PS, Schraufnagel RA.1996.A guide to coalbed methane reservoir engineering. Chicago: Gas Research Institute;

Sawyer WK, Paul GW and Schraufnagel RA,1990. Development and application of a 3-D coalbed simulator, Annual Technical Meeting, Petroleum Society of Canada.

Schroeder, K., Ozdemir, E., Morsi, B.I., 2002. Sequestration of carbon dioxide in coal seams. J. Energy & Environment Research 2, 54–63 1.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Schuyer, J.; Dijkstra, H.; van Krevelen, D. W. Fuel 1955, 34,251.

Scott M. Mackiewicz and Glen Ferguson E.,2005, 'Stabilization of Soil with Self-Cementing Coal Ashes', Kleinfelder, 7802 Barton, Lenexa, Kansas, 66214.

Seidle J.P., Jeansonne M.W. and Erickson D.J., 1992. Application of matchstick geometry to stress dependent permeability in coals. Society of Petroleum Engineers SPE Rocky Mountain Regional Meeting.

Seidle JP and Huitt IG .1995. Experimental measurement of coal matrix shrinkage due to gas desorption and implications for cleat permeability increases. SPE 30010, International Meeting on Petroleum Engineering, Beijing, China.

Sharma, M, Singh, A K, and Singh, M P, 2008. Genesis of natural cokes: some Indian examples, International Journal of Coal Geology, 75(1):40-48.

Shi J.Q. and Durucan S., 2004. Drawdown induced changes in permeability of coalbeds: a new interpretation of the reservoir response to primary recovery. Transport in Porous Media 56(3), 1–16.

Shi J.Q. and Durucan S., 2005. A model for changes in coalbed permeability during primary and enhanced methane recovery. SPE Reservoir Evaluation & Engineering, August, 291–299.

Shi J.Q. and Durucan S., 2010. Exponential growth in San Juan Basin Fruitland coalbed permeability with reservoir drawdown, model match and new insights. SPE Reservoir Evaluation and Engineering, 914–925.

Shi, J Q and Durucan, S. 2003, Changes in Permeability of Coalbeds During Primary Recovery--Part 1: Model Formulation and Analysis, Paper 0341 presented at the International Coalbed Methane Symposium, Tuscaloosa, Alabama, USA.

Shkuratnik, V. L. Filimonov, Y. L. and Kuchurin S. V., 2005 "Regularities of acoustic emission in coal samples under triaxial compression," Journal of Mining Science, vol. 41, no. 1, pp. 44– 52.

Siemons, N., Bruining, H. and Krooss, B.M., 2004. Upscaled diffusion in coal particles, Geologica Belgica- Volume 7(3-4) 12 pages.

Sing KSW, Everett DH, Haul RW, Moscou L, Pierotti RA, Rouquerol J, Siemieniewska T. 1985. Reporting physisorption data for gas/solid systems with special reference to the determination of surface area and porosity. Pure Appl Chem;57:603.

Sion Y, 2015. Analisa Injection Falloff Pada Sumur X dan Y di Lapangan CBM Sumatera Selatan dengan Menggunakan Software Ecrin, Seminar Nasional Cendekiawan 2015. ISSN: 2460-8696.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Siriwardane, R.K. Gondle, G.S. Bromhal. 2013. Coupled flow and deformation modeling of carbon dioxide migration in the presence of a caprock fracture during injection**.** Energy & Fuels, 27 (8) (2013), pp. 4232-4243.

Smyth, M., Buckley, M.J., 1993. Statistical analysis of the microlithotype sequences in the Bulli Seam, Australia, and relevance to permeability for coal gas. International Journal of Coal Geology 22, 167–187

Skawinski R. Considerations referring to coal swelling accompanying the sorption of gases and water. Arch Min Sci 1999;44:425–34.

Soehandojo, 1989, Coal exploration and exploitation review in Indonesia. Geologi Indonesia, vol. 12, no. 1, p. 279-325.

Sosrowidjojo I.B.,2013. Coal Geochemistry of The Unconventional Muaraenim Coalbed Reservoir, South Sumatera Basin: A Case Study From The Rambutan Field. Indonesian Mining Journal , Vol 16 No-2 : 71-88.

Sosrowidjojo, I.B. & Saghafi, A., 2009. Development of the first coal seam gas exploration program in Indonesia: Reservoir properties of the Muaraenim Formation, south Sumatera. International Journal of Coal Geology, 79(4), pp.145–156.

Sosrowidjojo, I.B., 2006. Coalbed Methane Potential in the South Palembang Basin, Proceedings of the International Geosciences Conference and Exhibition, IPA, 33th Annual Convention. In CD publication, Jakarta. File # CH-05, 5 p.

Stach, E., Mackowsky, M., Teichmuller, M., Taylor, G., Chandra, D., Teichmuller, R., 1982. Stach's Textbook of Coal Petrology. Gebruder Borntraeger, Berlin, 535 pp.

Stalder, P., 1976. A Review of The South Sumatera Coal Basin. Shell Minjbuow N.V., Jakarta, p. 17.

Stanton, R. W., Burruss, R. C., Flores, R. M., Warwick, and P. D, 2001: CO_2 Adsorption in low-rank coals: Progress toward assessing the nation-wide capacity to store CO_2 in the subsurface. Presented at the 18th Annual International Pittsburgh Coal Conference, Newcastle, NSW Australia, 3-7 December.

Stevens SH, Spector D, Reimer P. 1998.Enhanced coalbed methane recovery using CO_2 injection. In SPE international conference and exhibition, Beijing, China.

Stevens, S.H. and Hadiyanto, 2004. Indonesia: coalbed methane indicators and Basin evaluation, SPE 88630. SPE Asia Pacific oil and gas conference, 18-20 October2004, Perth, Australia, 8p.

Stevens, S.H., Sani, K., Hardjosuwiryo, S., 2001. Indonesia's 337 tcf CBM resource: a low-cost alternative to gas, LNG. Oil & Gas Journal 99, 40 - 45.

Streit, J.E., and Hillis, R.R., 2004. Estimating fault stability and sustainable fluid pressures for underground storage of CO_2 in porous rock: Energy, 29, 1445– 1456.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Su, X., Feng, Y., Chen, J., Pan, J., 2001. The characteristics and origins of cleat in coal from Western North China. International Journal of Coal Geology 47, 51–62.

Sudarmono. 1974. Pola struktur di daerah Cekungan Sumatera Selatan. Stanvac Indonesia, 20 pp (unpublished).

Sun X, Yao Y, Liu D, Elsworth D & Pan Z.,2016. Interactions and exchange of CO_2 and H2O in coals an investigation by low-feld NMR relaxation. Scientific RepoRts - 6:19919 - DOI: 10.1038/srep19919. www.nature.com/scientificreports.

Susilawati and Ward, 2006. Metamorphism of mineral matter in coal from Bukit Asam deposit, South Sumatera. Intl J.Coal Geol.2006,68: 171-195 (Cross Ref)

Susilawati R, Evans P.N, Esterle J.S, Robbins S.J., Tyson G.W., Golding S.D, Mares T.E.,2015. Temporal changes in microbial community composition during culture enrichment experiments with Indonesian Coals. International Journal of Coal Geology 137 (2015). 66-67.

Susilawati, R., Papendick, S.L., Gilcrease, P.C., Esterle, J.S., Golding, S.D., Mares, T.E., 2013.

Susilawati. 1992. *Proses Pembentukan Batubara*. Analisa Penelitian dan Pengembangan Geologi, ITB, Bandung.

Szwilski, A.B., 1984. Determination of the anisotropic elastic moduli of coal. Int. J. Rock.

Takanohashi T., Terao Y. & Lini M., 2000. Sorption behaviors of methanol vapor by coal extracts and residues. Fuel, 79, 3–4, 349–353.

Thomas, L.P., 2005. Fuel resources: coal. In: Sumatera: Geology, Resources and Tectonic Evolution, Barber, A.J., Crow, M.J., and Milsom, J.S., eds., Geological Society, London, Memoirs No. 31, p. 142-146.

Ting, F.T.C., 1977. Origin and spacing of cleats in coalbeds. J. Pressure Vessel Technol. Trans. ASME 99, 624–626.

Tremain, C.M., Laubach, S.E., Whitehead, N.H., 1991. Coal fracture cleat patterns in Upper Cretaceous Ž . Fruitland Formation, San Juan Basin, Colorado and New Mexico: implications for exploration and development. In: Schwochow, S., Murray, D.K., Fahy, M.F. Eds. , Coalbed methane of Western North Ž . America. Rk. Mt. Assoc. Geol., pp. 49–59.

Trollope DH, Rosengren KJ, Brown ET. The mechanics of brown coal. Geo- Technique 1965;15:363–86.

UNIPCC. 2007. Renewable energy sources and climate change mitigation: special report of the intergovernmental panel on climate change. In: Edenhofer O, Madruga RP, Sokona Y, Seyboth K, Matschoss P, Kadner S, Zwickel T, Eickemeier P, Hansen G, Schlömer S, von Stechow C, editors. Cambridge: Cambridge University Press.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Vaziri, H.H., Wang, X., Palmer, I.D., Khodaverdian, M., McLennan, J., 1997. International Journal of Rock Mechanics and Mining Sciences 34, 963–978.

Viete DR, Ranjith PG., 2006. The effect of CO_2 on the geomechanical and permeability behaviour of brown coal: implications for coal seam CO_2 sequestration. Int J Coal Geol 2006; 66(3):204–16.

Viete, D.R. & Ranjith, P.G., 2007. The mechanical behaviour of coal with respect to CO_2 sequestration in deep coal seams. Fuel, 86(17–18), pp.2667–2671.

Vinokurova, E.B., Bogomolova, L.I., Ketslakh, A.I., Kontorovich, S.I., 1988. Crushing of gas-saturated anthracites. Colloid J. USSR 50 (1), 112–114.

Vishal, V. Singh, T.N., 2015. A laboratory investigation of permeability of coal to supercritical CO_2. Geotech. Geol. Eng, 33, 1009–1016.

Vorres, K.S., 1986. Chemistry of Mineral Matter and Ash in Coal: An Overview. Mineral Matter and Ash in Coal. Chapter 1, pp 1–8. DOI: 10.1021/bk-1986-0301.ch001 ACS Symposium Series, Vol. 301, ISBN13: 9780841209596eISBN: 9780841211339.

Waluyo B.H., 1992. The assessment of Banko Barat Coal of South Sumatera as a fuel for the Suralaya Steam Power electric generating plant in West of Java, Indonesia. Master Thesis, Department of Geology. *University of Wollongong*.

Wang, Dexin & Bao, Ainan & Kunc, Walter & Liss, William, 2012. "Coal power plant flue gas waste heat and water recovery," Applied Energy, Elsevier, vol. 91(1), pages 341-348.

Wang, L., Cheng, Y. P., Ge, C. G., Chen, J. X., Li, W., Zhou, H. X., et.al.,.,2013. Safety technologies for the excavation of coal and gas outburst-prone coal seams in deep shafts. International Journal of Rock Mechanics and Mining Sciences, 57, 24e33.

Wang, X.J., Ward, C.R., 2009. Experimental investigation of permeability changes with pressure depletion in relation to coal quality. International Coalbed Methane Symposium University of Alabama.

Warren JE, Root PJ. 1963 The behavior of naturally fractured reservoirs. SPE J; 3:235–55.

Wei, Z. Zhang, D., 2010. Coupled fluid-flow and geomechanics for triple-porosity/dual-permeability modeling of coalbed methane recovery. International Journal of Rock Mechanics and Mining Sciences, 47(8), 1242-1253.

White, C.M., Smith, D.H., Jones, K.L., et.al.,.2005. Sequestration of carbon dioxide in coal with enhanced coalbed methane recovery: a review. Energy Fuels 19 (3), 659–724.

UNIVERSITAS GADJAH MADA
DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN
RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya
Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/

Widarsono B, and Kosasih., 2013. Modified log Analysis Model for South Sumatera Coalbed Methane Reservoir. Jurnal Teknologi Minyak dan Gas Bumi. JTMGB Vol.4 No.1 (2013) :35-47.

Winans and Crelling, 1984."Chemistry and Characterization of Coal Macerals," ACS Symposium Series, vol. 252, pp. 1–20.

Withjack, E. M., 1988**.** "Computed Tomography for Rock Property Determination and Fluid-Flow Visualization"**,** SPE Formation Evaluation, 696-704.

Wong S,2000. Gunter W, Mavor M. Economics of CO_2 sequestration in coalbed methane reservoirs. In: SPE/CERI gas technology symposium.

World's Resources Institute, 2017.https://www.wri.org/

Wyllie, M. R. J., Gregory, A. R., and Gardner, L. W., 1956, Elastic wave velocities in heterogeneous and porous media: Geophysics, 21, 4 l-70.

Wyman RE. 1984; Gas resources in elm worth coal seams. AAPG Memoir 1984;38:173–87.

Yang R.T.1997. Gas Separation by Adsorption Processes (Chapter 4), London: Imperial College Press.

Yang RT, Saunders JT. 1985.Adsorption of gasses on coals and heat treated coals at elevated temperature and pressure: adsorption from hydrogen and methane as single gases. Fuel;64:616–20.

Yao Y, Liu D, Tang D, Tang S, Che Y, Huang W.,2009. Preliminary evaluation of the coalbed methane production potential and its geological controls in the Weibei Coal- field, Southeastern Ordos Basin, China. International Journal of Coal Geology; 78(1):1e15.

Yoon, P., and Thodos, G., AICHE Journal, 16:300 (1970).

Zhang, S.Y., Yan, J.W., 1998. Non-linear acoustic porosity model and its application. Oil Geophys. Prospect. 33, 671–678, 690 (in Chinese).

Zhao Y, Hu Y, Zhao B, Yang D ,2004. Nonlinear coupled mathematical model for solid deformation and gas seepage in fractured media. Transp Porous Media 55(2):119–136.

Zheng S, Lili X. 2011. Modelling and simulation of a new dual porosity CBM reservoir model with an improved permeability model through horizontal wells. SPE Middle East Unconventional Gas C.

UNIVERSITAS
GADJAH MADA

DYNAMIC CHANGES IN CO2 SORPTION KINETICS OF TANJUNG ENIM LOW RANK COAL AT BUKIT ASAM COAL FIELD, SOUTH SUMATERA BASIN

RAHIM, AFIKAH, Dr. Sugeng Sapto Surjono, Dr. Donatus Hendra Amijaya

Universitas Gadjah Mada, 2019 | Diunduh dari http://etd.repository.ugm.ac.id/