

## DAFTAR PUSTAKA

- Abd Mutalib, M., Rahman, M. A., Othman, M. H. D., Ismail, A. F. dan Jaafar, J., 2017, *Scanning Electron Microscopy (SEM) and Energy-Dispersive X-Ray (EDX) Spectroscopy. Membrane Characterization*, pp 161-179. doi:10.1016/b978-0-444-63776-5.00009-7.
- Adams, B.R., Mostafa, A., Schwartz, Z. and Boyan, B.D., 2013, *Society for Biomaterials*, pp. 3237-3242. doi: 10.1002/jbm.a.34994.
- Agrawal, C.M., Ong, J.L., Appleford, M.R. dan Mani, G., 2014, *Introduction to Biomaterials: Basic Theory with Engineering Applications*, Cambridge University Press, United Kingdom.
- Ainunnisa, R.R., 2013, Variasi Waktu Perendaman Dalam Simulated Body Fluid Pada Komposisi Hidroksiapatit-Gelatin Sebagai Kandidat Bone Graft, *Skripsi*, Universitas Airlangga.
- Ambarwati, R. dan Trijoko, 2010, Morfologi Fungsional Kerang Batik *Paphia undulata* (Bivalvia: Veneridae), 16, pp 83-87.
- Anwar, A., Asghar, M.N., Kanwal, Q., Kazi, M. dan Sadiqa A., 2016, Low Temperature Synthesis And Characterization Of Carbonated Hydroxyapatite Nanocrystals, *Journal Of Molecular Structure*, 1117(2016), pp 283-286. doi: 10.1016/j.molstruc.2016.03.061.
- Apriliani, I., 2012, Bioekologi Kerang Tahu (*Meretrix meretrix*, L. 1785) Di Muara Sungai Juru Tulis Dan Muara Sungai Terusan, Pantai Mayangan Jawa Barat, *Skripsi*, Fakultas Perikanan dan Ilmu Kelautan, Institut Pertanian Bogor, Bogor.
- Bang, L.T., Ramesh, S., Purbolaksono, J., Ching, Y.C., Long, B.D., Chandran, H. dan Othman, R., 2015, Effects Of Silicate And Carbonate Substitution On The Properties Of Hydroxyapatite Prepared By Aqueous Co-Precipitation Method, *Materials and Design*, 87, pp. 788-796. doi: 10.1016/j.matdes.2015.08.069.
- Barinov, S.M., Rau, J.V., Cesaro, S.N., Durlsin, J., Fadeeva, I.V., Ferro, D., Medvecky, L. dan Trionfetti, G., 2006, Carbonate Release From Carbonated Hydroxyapatite In The Wide Temperature Range, *Journal Material Science: Material Medics*, 17(2006), pp 597-604. doi: 10.1007/s10856-006-9221-y.
- Bose, S. dan Bandyopadhyay, A., 2013, *Characterization of Biomaterials*, Elsevier, USA.

- Bunaciu, A.A., Udristioiu, E.G. dan Abdoul-Enein H.Y., 2015 X-Ray Diffraction: Instrumentation And Applications, *Critical Reviews in Analytical Chemistry*, 45(4), pp 289-299. doi: 10.1080/10408347.2014.949616.
- Bushroa, A.R., Rahbari, R.G., Majuki, H.H. dan Muhamad, M.R., 2011, Approximation Of Cristallite Size And Microstrain Via XRD Line Boardening Anlysis In TiSiN Thin Films, *Vacuum*, 86(2012), pp 1107-1112. doi: 10.1016/j.vacuum.2011.10.011.
- Cahyaningrum, S.E., Herdyastuty, N. dan Supangat, D., 2017, Synthesis And Characterization Of Hydroxyapatite Powder By Wet Precipitation Method, *Materials Science and Engineering*, 299. doi: 10.1088/1757-899X/299/1/012039.
- Chatla, D. dan Padmavathi, P., 2018, Preliminary Assesment Of Calcium In Six Molluscan Shells Of Tamilnadu Coast, India, *Ecology, Environment and Conservation*, 24(1), pp 302-305. doi: 10.13140/RG.2.2.30050.79048.
- Cox, S., 2014, *Synthesis method of hydroxyapatite*, Ceram, University of Birmingham.
- Dabouineau, L. dan Ponsero, A., 2009, Synthesis on Biology of Common European Cockle *Cerastoderma edule*, Dikutip dari <https://www.researchgate.net/publication/50894727>. Diakses pada Tanggal 24 Januari 2019.
- Damayanti, E., 2012, Pengaruh Suhu Sintering Terhadap Karkteristik Struktur dan Mikrostruktur Komposit MgO-SiO<sub>2</sub> Berbasis Silika Sekam Padi, *Skripsi*, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Lampung.
- Doi, Y., 1997, Sintered Carbonate Apatite, *Cells and Materials*, 7(2), pp. 111-122.
- Doi, Y., Moriwaki, Y., Aoba, T., Okazaki, M., Takashi, J. dan Joshin, K., 1982, Carbonate Apatites From Aqueous And Non-Aqueous Media Studied By ESR, IR, And X-ray Diffraction: Effect Of NH<sub>4</sub><sup>+</sup> Ions On Crsytallographic Parameters, *Journal Of Dental Research*, 61(2), pp 429-434.
- Dos Santos, V., Venina, Brandalise, Nichele, R., Savaris dan Michele, 2017, *Engineering of Biomaterials, Topics in Mining, Metallurgy and Materials Engineering*, pp 5-15. doi: 10.1007/978-3-319-58607-6\_2.
- Ellies, L.G., Nelson, G.A. dan Featherrstone, J.D.B., 1988, Crystallographic Structure And Surface Morphology Of Sintered Carbonated Apatite, *Journal Of Biomedical Material Research*, 22(1988), pp 541-553.
- Ezekiel, I., Kasim, S.R., Ismail, Y.M.B. dan Noor, A.F.M., 2018, Nanoemulsion Synthesis Of Carbonated Hydroxyapatite Nanopowders: Effect Of Variant

$\text{CO}_3^{2-}/\text{PO}_4^{3-}$  Molar Ratios On Phase, Morphology, And Bioactivity, *Ceramics International*, doi: 10.1016/j.ceramint.2018.04.128.

Ferdinand, F. dan Ariebowo, M., 2009, *Praktis Belajar Biologi 2*, Visindo Media Persada, Jakarta.

Fleet, M., 2015, *Carbonated Hydroxyapatite: Materials, Synthesis and Application*, Pans Stanforfd Publishing, United States.

Food and Agriculture Organization of the United Nations, 2019, Species Fact Sheets: *Cerastoderma edule* (Linnaeus, 1758), Fisheries and Aquaculture and Departement, [www.fao.org/fishery/species/3535/en](http://www.fao.org/fishery/species/3535/en) diakses pada pukul 15.35 tanggal 25 Januari 2019.

Gamelas, J.A.F. dan Martins, A.G., 2015, Surface Properties Of Carbonated And Non-Carbonated Hydroxyapatite Obtained After Bone Calcination At Different Temperatures, *Colloids And Surfaces A: Physicochemical And Engineering Aspects*, 478(2015), pp 62-70. doi: 10.1016/j.colsurfa.2015.03.044.

Gao, H., Ji, B., Jager, I. L., Arzt, E., & Fratzl, P. (2003). Materials become insensitive to flaws at nanoscale: Lessons from nature. *Proceedings of the National Academy of Sciences*, 100(10), 5597–5600. doi:10.1073/pnas.0631609100

Garskaite, E., Gross, K.A., Yang, S.W., Yang, T.C.K., Yang, J.C. dan Kareiva, A., 2014, Effect Of Processing Conditions On The Crystallinity And Structure Of Carbonated Calcium Hydroxyapatite (CHAp), *The Royal Society Of Chemistry*, 10.1016/j.molstruc.2016.04.080.

Gemaini, M.M., Detsch, R., Grunewald, A., Magnaudeix, A., Lalloue, F., Boccaccini, A.R. and Champion, E., 2017, Osteoblast And Osteoclast Responses To Porous A/B Carbonate-Substituted Hydroxyapatite Ceramics For Bone Regeneration, *Biomedic Material*, 41 6149-57, doi: 10.1088/1748-605X/aa69c3.

Ghafar, S.L.M.A., Hussein, M.Z. dan Zakaria, Z.A.B., 2017, Synthesis And Characterization Of Cockle Shell-Based Calcium Carbonate Aragonite Polymorph Nanoparticle With Surface Functionalization, *Journal of Nanoparticle*, doi: 10.1155/2017/8196172.

Gosling, E., 2003, *Bivalve Molluscs: Biology, Ecology and Culture*, Fishing News Books, United Kingdom.

Gurumrthy, B.R., Bhatia, D. dan Ramesh, K.P., 2017, Structural Analysis of Merino Wool, Pashmina and Angora Fibers Using Analytical Instruments Like Scanning Electron Microscopoe and Infra-Red Spectroscopy,

*International Journal of Engineering Technology Science and Research*, 4, pp 112-125.

Habibovic, P., Juhl, M. V., Clyens, S., Martinetti, R., Dolcini, L., Theilgaard, N. dan Blitterswijk, C.A.V, 2010, *Comparison of Two Carbonated Apatite Ceramics In Vivo*, *Acta Biomaterialia*, 6, pp 2219-2226. doi: 10.1016/j.actbio.2009.11.028

Hudecki, A., Kiryczyński, G., dan Łos, M. J., 2019, *Biomaterials, Definition, Overview, Stem Cells and Biomaterials for Regenerative Medicine*, 85–98. doi:10.1016/b978-0-12-812258-7.00007-1.

Infodatin, 2015, *Data dan Kondisi Penyakit Osteoporosis di Indonesia*, Kementerian Kesehatan RI Pusat Data dan Informasi, Jakarta.

Inkson, B. J., 2016, *Scanning Electron Microscopy (SEM) And Transmission Electron Microscopy (TEM) For Materials Characterization. Materials Characterization Using Nondestructive Evaluation (NDE) Methods*, pp 17-43. doi:10.1016/b978-0-08-100040-3.00002-x.

Jayadev, S. dan Sargunar, J., 2011, *Engineering Mathematics* (volume II), India, Dorling Kindersley.

Jayasree, R., Madhumathi, K., Rana, D., Ramalingam, M., Nankar, R.P., Doble, M. dan Kumar, T.S.S., 2018, Development Of Egg Shell Derived Carbonated Apatite Nanocarrier System For Drug Delivery, *Journal Of Nanoscience And Nanotechnology*, 18(4), pp 2318-2324. doi: 10.1166/jnn.2018.14377.

Kamenetskaya, O.F., Kol'tsov, A., Kuz'mina, M., Zorina, M. dan Poritskaya, L., 2011, Ion Substitutions And Non-Stoichiometry Of Carbonated Apatite-(CaOH) Synthesised By Precipitated And Hydrothermal Method, *Journal of Molecular Structure*, 992(2011), pp 9-18. doi: 10.1016/j.molstruc.2011.02.013.

Kee, C.C., Ismail, H. dan Noor, A.F.M., 2013, Effect Of Synthesis Technique And Carbonate Content On The Crystallinity And Morphology Of Carbonated Hydroxyapatite, *Journal Of Material Science And Technology*, 29(8), pp 761-764. doi: 10.1016/j.jmst.2013.05.016.

Kovaleva, Elena S., Shabanov, Maxim P., Putlyaev, Valery I., Tretyakov, Yury D., Ivanov, Vladimir K. and Silkin, Nikolay I., 2009, Bioresorbable Carbonated Hydroxyapatite  $\text{Ca}_{10-x}\text{Na}_x(\text{PO}_4)_{6-x}(\text{CO}_3)_x(\text{OH})_2$  Powders For Bioactive Materials Preparation, *Central European Journal of Chemistry*, 7(2), pp. 166-174. doi: 10.2478/s11532-009-0018-y.

- Lafon, J.P., Champion, E. and Bernache-Assollant, D., 2008, Processing Of AB-Type Carbonated Hydroxyapatite  $\text{Ca}_{10-x}(\text{PO}_4)_{6-x}(\text{CO}_3)_x(\text{OH})_{2-x-2y}(\text{CO}_3)_y$  Ceramics With Controlled Composition, *Journal of the European Ceramic Society*, 28, pp. 139-147. doi: 10.1016/j.jeurceramsoc.2007.06.009.
- Landi, E., Celotti, G., Logroscino, G. dan Tampieri, A., 2004, Carbonated hydroxyapatite as bone substitute, *Journal of the European Ceramic Society*, 23 (2003), pp. 2931–2937. doi: 10.1016/S0955-2219(03)00304-2
- Landi, E., Tampieri, A., Celotti, G., Vichi, L. and Sandri, M., 2004, Influence of synthesis and sintering parameters on the characteristics of carbonate apatite, *Biomaterials*, 25, pp. 1763-1770. doi: 10.1016/j.biomaterials.2003.08.026.
- Laonapakul, T., 2015, Synthesis of hydroxyapatite from biogenic waste, *KKU Engineering Journal*, 42(3), pp. 269-275. doi: 10.14456/kkuenj.2015.30.
- LeGeros, R. Z., Kukowska, R., Bautista, C., and LeGeros J.P., 1995. Synergistic Effects Of Magnesium And Carbonate On Properties Of Biological And Synthetic Apatites, *Connective Tissue Research*, 33(1-3), pp. 203-209.
- LeGeros, R. Z., Trautz, O. R., Klein, E., & LeGeros, J. P. (1969). Two types of carbonate substitution in the apatite structure. *Experientia*, 25(1), pp. 5–7. doi:10.1007/bf01903856
- Liao, S., Watari, F., Xu, G., Ngiam, M., Ramakrishna, S. dan Chan, C.K., 2007, Systematic fabrication of nano-carbonated hydroxyapatite/collagen composites for biomimetic bone grafts, *Bioinspiration and Biomimetics*. 2 (2007) 37–41. doi: 10.1088/1748-3182/2/3/001
- Linnaeus, C., 1758, *Systema Naturae Per Regna Tria Natura, Secundum Classes, Ordines, Genera, Species, Cum Characteribus, Differentiis, Synonymis, Locis*. Editio decimal, reformata. Dikutip dari <http://www.biodiversitylibrary.org/item/10277#page/3/mode/1up>. Diakses pada Tanggal 24 Januari 2019.
- LIPI. 2018. Padukan Logam Gantikan Tulang. Dikutip dari <http://lipi.go.id/lipimedia/Padukan-Logam-Gantikan-Tulang/19869>. Diakses pada Tanggal 15 januari 2019 pukul 12.38
- Liu, Q., Matinlinna, J.P., Chen, Z., Ning, C., Ni, G., Pan, H. dan Darvell, B.W., 2014, Effect Of Thermal Treatment On Carbonated Hydroxyapatite: Morphology, Composition, Crystal Characteristics And Solubility, *Ceramics International*, 41(2015), pp 6349-6157. doi: 10.1016/j.ceramint.2014.11.062.

- Madupalli, H., Pavan, B. dan Tecklenburg, M.M.J., 2017, Carbonate Substitution In The Minimal Component Of Bone: Discriminating The Structural Changes, Simultaneously Imposed By Carbonate In A And B Sites Of Apatite, *Journal of Solid State Chemistry*. doi: 10.1016/j.jssc.2017.07.025.
- Mawuntu, V.J. dan Yusuf, Y., 2018, Porous-Structure Engineering Of Hydroxyapatite-Based Scaffold Synthesized From *Pomacea canaliculata* Shell By Using Polyethylene Oxide As Polymeric Porogen, *IOP Conference Series: Materials Science and Engineering*, doi: 10.1088/1757-899X/432/1/012045.
- Mishra, R.K., Zachariah, A.K. dan Thomas, S., 2017, *Energy Dispersive X-Ray Spectroscopy Technique For Nanomaterial, Microscopy Methods in Nanomaterial Characterization*, 2017, pp 383-405. doi: [10.1016/B978-0-323-46141-2.00012-2](https://doi.org/10.1016/B978-0-323-46141-2.00012-2).
- Mohammad, N.F., Muhammed M.H., Zakaria, Z., Abdullah, A.A. dan Mohammad, I.S., 2012, Characterization Of Calcium Phosphate Bioceramic From *Paphia undulata* Shells, *International Conference on Biomedical Engineering*, pp 114-116.
- Núñez, D., Elgueta, E., Varaprasad, K. dan Oyarzún, P., 2018, Hydroxyapatite Nanocrystals Synthesized from Calcium Rich Bio-wastes, *Materials Letters*, doi:10.1016/j.matlet.2018.07.077.
- Ofudje, E.A., Rajendran, A., Adegun, A.I. dan Idowu, M.A., 2018, Synthesis Of Organic Derived Hydroxyapatite Scaffold From Pig Bone Waste For Tissue Engineering Applications, *Advanced Powder Technology*, 29(2018), pp 1-8. doi: 10.1016/j.appt.2017.09.008
- Ortali, C., Julien, I., Vandenhende, M., Douet, C. and Champion, E., 2018, Consolidation Of Bone-Like Apatite Bioceramics By Spark Plasma Sintering Of Amorphous Carbonated Calcium Phosphate At Very Low Temperature, *Journal of the European Ceramic Society*, 38, pp. 2098-2109. doi: 10.1016/j.jeurceramsoc.2017.11.051.
- Othman, R., Mustafa, Z., Loon, C.W. dan Noor, A.F.M., 2016, Effect Of Calcium Precursors And pH On The Precipitation Of Carbonated Hydroxyapatite, *Procedia Chemistry*, 19(2016), pp 539-545. doi: 10.1016/j.proche.2016.03.050.
- Pawarangan, I. dan Yusuf, Y., 2018, Characteristics Of Hydroxyapatite From Buffalo Bone Waste Synthesized By Precipitation Method, *IOP Conference Series: Materials Science and Engineering*, doi: 10.1088/1757-899X/432/1/012044.



- Rajabi-Zamani, A.H., Behnamghader, A., and Kazemzadeh, A., 2008, Synthesis Of Nanocrystalline Carbonated Hydroxyapatite Powder Via Nanoalkoxide Sol-Gel Method, *Materials Science & Engineering C*, 28, pp. 1326-1329. doi: 10.1016/j.msec.2008.02.001.
- Ratnayake, J.T.B., Dias, G.J. dan Mucalo, M., 2016, Substituted Hydroxyapatite For Bone Regeneration: A Review Of Current Trends, Society For Biomaterials. doi: 10.1002/jbm.b.33651.
- Riskesdas, 2007, *Laporan Nasional 2007*, Badan Penelitian dan Pengembangan Kesehatan Departemen Kesehatan RI, Jakarta.
- Riskesdas, 2007, *Laporan Nasional 2013*, Badan Penelitian dan Pengembangan Kesehatan Departemen Kesehatan RI, Jakarta.
- Rizkayanti, Y. dan Yusuf, Y., 2018, Effect of Temperature On Synthesis Hydroxyapatite From Cockle Shells (*Andara granosa*), *International Journal Of Nanoelectronics And Materials*, 11(2018), pp 43-50.
- Ruiz, M.G., Hernandez, J., Banos, L., Montes, J.N. dan Garcia, M.E.R., 2009, Characterization Of Calcium Carbonate, Calcium Oxide And Calcium Hydroxide As Starting Point To The Improvement Of Lime For Their Use In Construction, *Journal Of Materials In Civil Engineering*, doi: 10.1061/(ASCE)0899-1561(2009)21:11(694).
- Sanosh, K.P., Chu, M.C., Balakrishnan, A., Kim T.N. dan Cho, S.J., Preparation and characterization of nano-hydroxyapatite powder using sol-gel technique, *Bull. Mater. Sci.*, 32(5), pp. 465–470.
- Sari, M. dan Yusuf, Y., 2018, Synthesis And Characterization Of Hydroxyapatite Based On Green Mussel Shells (*Perna viridis*) With The Variation Of Stirring Time Using The Precipitation Method, *IOP Conference Series: Materials Science and Engineering*, doi: 10.1088/1757-899X/432/1/012046.
- Sawant, P.P., 2012, Morphology And Biology Of *Meretrix meretrix* (Linnaeus, 1758) Along Ratnagiri Coast Maharashtra, *Tesis*, Maharashtra state, India.
- Setiono dan Pujaatmaka, A.H., 1985, *Buku Teks Analisis Anorganik Kualitatif Makro dan Semimikro*, (diterjemahkan dari Vogel, 1978, Textbook of Macro and Semimicro Qualitative Inorganic Analysis, Logman Group Limited, London), Kalman Media Pustaka, Jakarta.
- Shi, Donglu, 2004, *Biomaterials and tissue Engineering*, Springer, New York.
- Shu, C., Yanwei, W., Hong, L., Zhengzheng, P. dan Kangde, Y., 2005, Synthesis Of Carbonated Hydroxyapatite Nanofibers By Mechanochemical Methods, *Ceramics International*, 31(2005), pp 135-138. doi: 10.1016/j.ceramint.2004.04.012.

- Slosarczyk, A., Paskiewicz, Z. dan Paluszkiewicz, C., 2004, FTIR And XRD Evaluation Of Carbonated Hydroxyapatite Powders Synthesized By Wet Methods, *Journal Of Molecular Structure*, 744-747(2005), pp 657-661. doi: 10.1016/j.molstruc.2004.11.078.
- Slosarczyk, A., Paszkiewicz, Z. dan Zima, A., 2010, The Effect Of Phosphate Source On The Sintering Of Carbonate Substituted Hydroxyapatite, *Ceramics International*, 36(2010), pp 577-582. doi: 10.1016/j.ceramint.2009.09.032.
- Solodyankina, A., Nikolaev, A., Kamenetskaya, O.F. dan Golovanova, O., 2016, Synthesis And Characterization Of Nanocrystalline Apatites From Solution Modeling Human Blood, *Journal Of Molecular Structure*, 1119(2016), pp 484-489. doi: 10.1016/j.molstruc.2016.04.080.
- Suchanek, W. J., Shuk, P., Byrappa, K. and Riman, R. E., 2002, Mechanochemical-Hydrothermal Synthesis Of Carbonated Apatite Powders At Room Temperature, *Biomaterials*, 23, pp. 699-710.
- Syafaat, F.Y. dan Yusuf, Y., 2018, Effect Of Ca:P Concentration and Calcination Temperature On Hydroxyapatite (HAp) Powders From Quail Eggshell (*Coturnix coturnix*), *International Journal Of Nanoelectronics And Materials*, 11(2018), pp 51-58.
- Tang, C.Y. dan Yang, Z., 2017, *Membranes Characterization: Transmission Electron Microscopy (TEM)*, Elsevier, pp 145-159. doi: 10.1016/B978-0-444-63776-5.00008-5.
- Theophanides, T., 2012, Introduction To Infrared Spectroscopy. *Infrared Spectroscopy Material Science, Engineering and Technology*. doi: 10.5772/49106.
- Toney, M. F., 1992, *XRD. Encyclopedia of Materials Characterization*, pp 198–213. doi:10.1016/b978-0-08-052360-6.50021-7.
- Venkatesh, D., Prasad M.S.R., Babu, B.R., Ramesh, K.V. dan Trinath, K., 2015, Effect of Sintering Temperature on the Micro Strain and Magnetic Properties of Ni-Zn Nanoferrites, *Journal of Magnetism*, 20(3), pp. 229-240. doi: 10.4283/JMAG.2015.20.3.229
- Wong, W.Y. dan Noor, A.F.M., 2016, Synthesis And Sintering-Wet Carbonation Of Nano-Sized Carbonated Hydroxyapatite, *Procedia Chemistry*, 19(2016), pp 98-105. doi: 10.1016/j.proche.2016.03.121.
- Wu, Y.S., Lee, Y.H. dan Chang, H.C., 2009, Preparation and characteristics of nanosized carbonated apatite by urea addition with coprecipitation method,



*Materials Science and Engineering C*, 29 (2009), pp. 237–241. doi: 10.1016/j.msec.2008.06.018

Yang, W.H., Xi, X.F., Li, J.F. and Cai, K.Y., 2013, Comparison of Crystal Structure Between Carbonated Hydroxyapatite And Natural Bone Apatite With Theoretical Calculation, *Asian Journal of Chemistry*, 23(7), pp. 3673-3678. doi: 10.14233/ajchem.2013.13709.

Zaman, T., Mostari, Mst. S., Al Mahmood, Md. A., dan Rahman, Md. S., 2018, Evolution and characterization of eggshell as a potential candidate of raw material, *Cerâmica*, 64 (2018), pp. 236-241. doi: 10.1590/0366-69132018643702349