



UNIVERSITAS
GADJAH MADA

**KEKUATAN TEKAN DAN TEKUK SERTA KETANGGUHAN 3D PRINTED POLY(METHYL
METHACRYLATE) SEBAGAI KANDIDAT
MATERIAL UNTUK BASEPLATE GIGI TIRUAN LENGKAP**

Ananda Firly Nugroho, Dr. Budi Arifvianto, S.T., M.Biotech. ; Dr. Urip Agus Salim, S.T., M.Eng.Sc.
Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Attaran, M. (2017). The rise of 3-D printing: The advantages of additive manufacturing over traditional

manufacturing. *Business Horizons*, 677–688.

Ayman, A.-D. (2017). The residual monomer content and mechanical properties of CAD\CAM resins used in the fabrication of complete dentures as compared to heat cured resins. *Electronic Physician*, 9(7), 4766–4772. <https://doi.org/10.19082/4766>

Barbur, I., Opris, H., Crisan, B., Cuc, S., Colosi, H. A., Baciut, M., Opris, D., Prodan, D., Moldovan, M., Crisan, L., Dinu, C., & Baciut, G. (2023). Statistical Comparison of the Mechanical Properties of 3D-Printed Resin through Triple-Jetting Technology and Conventional PMMA in Orthodontic Occlusal Splint Manufacturing. *Biomedicines*, 11(8), 2155. <https://doi.org/10.3390/biomedicines11082155>

Barsby, M. J. (1992). A denture base resin with low water absorption. *Journal of Dentistry*, 20(4), 240–244.
[https://doi.org/10.1016/0300-5712\(92\)90094-S](https://doi.org/10.1016/0300-5712(92)90094-S)

Basker, R. M., Davenport, J. C., & Tomlin, H. R. (1996). *Perawatan Prostodontik bagi Pasien Tak Bergigi*.

Berli, C., Thieringer, F. M., Sharma, N., Müller, J. A., Dedem, P., Fischer, J., & Rohr, N. (2020). Comparing the mechanical properties of pressed, milled, and 3D-printed resins for occlusal devices. *The Journal of Prosthetic Dentistry*, 124(6), 780–786. <https://doi.org/10.1016/j.jprosdent.2019.10.024>

Braszkiewicz, M. (2021). *Manufacturing of mechanical elements with properties of metamaterials using 3D printing technology*. In *MATEC Web of Conferences* (Vol. 338, p. 01002). EDP Sciences.

Buduru, S., Culic, B., Talmaceanu, D., & Pal, A. (2019). A COMPARATIVE STUDY OF THE ACCURACY OF FIVE CAD-CAM SYSTEMS. *Medicine and Pharmacy Reports*. <https://doi.org/10.15386/cjmed-1131>

Chhabra, M., Nanditha Kumar, M., RaghavendraSwamy, K. N., & Thippeswamy, H. M. (2022). Flexural strength and impact strength of heat-cured acrylic and 3D printed denture base resins- A comparative in vitro study. *Journal of Oral Biology and Craniofacial Research*, 12(1), 1–3.
<https://doi.org/10.1016/j.jobcr.2021.09.018>

Chockalingam, K., Jawahar, N., & Chandrasekhar, N. (2006). Influence of layer thickness on mechanical properties in stereolithography. *Rapid Prototyping Journal*.



UNIVERSITAS
GADJAH MADA

**KEKUATAN TEKAN DAN TEKUK SERTA KETANGGUHAN 3D PRINTED POLY(METHYL
METHACRYLATE) SEBAGAI KANDIDAT
MATERIAL UNTUK BASEPLATE GIGI TIRUAN LENGKAP**

Ananda Firly Nugroho, Dr. Budi Arifvianto, S.T., M.Biotech. ; Dr. Urip Agus Salim, S.T., M.Eng.Sc.

Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Craig, R. G., Powers, J. M., & Sakaguchi, R. L. (2011). *Craig's Restorative Dental Materials* (13th ed.).

Mosby Elsevier.

Cunha, T. R., Della Vecchia, M. P., Regis, R. R., Ribeiro, A. B., Muglia, V. A., Mestriner, W., & De Souza, R.

F. (2013). A randomised trial on simplified and conventional methods for complete denture fabrication: Masticatory performance and ability. *Journal of Dentistry*, 41(2), 133–142.

<https://doi.org/10.1016/j.jdent.2012.09.008>

De Jager, N., Müunker, T. J. A. G., Guilardi, L. F., Jansen, V. J., Sportel, Y. G. E., & Kleverlaan, C. J. (2021).

The relation between impact strength and flexural strength of dental materials. *Journal of the Mechanical Behavior of Biomedical Materials*, 122, 104658.

<https://doi.org/10.1016/j.jmbbm.2021.104658>

Faot, F., Costa, M. A., Del Bel Cury, A. A., & Rodrigues Garcia, R. C. M. (2006). Impact strength and fracture morphology of denture acrylic resins. *The Journal of Prosthetic Dentistry*, 96(5), 367–373.

<https://doi.org/10.1016/j.prosdent.2006.08.001>

Fijoł, N., Aguilar-Sánchez, A., & Mathew, A. P. (2022). 3D-printable biopolymer-based materials for water treatment: A review. *Chemical Engineering Journal*, 430, 132964.

<https://doi.org/10.1016/j.cej.2021.132964>

Fouassier, J. P. (1995). Photoinitiation, photopolymerization, and photocuring: Fundamentals and applications. *Munich:Hanser*.

Gad, M. M., Alshehri, S. Z., Alhamid, S. A., Albarrak, A., Khan, S. Q., Alshahrani, F. A., & Alqarawi, F. K. (2022). Water Sorption, Solubility, and Translucency of 3D-Printed Denture Base Resins. *Dentistry Journal*, 10(3), 42. <https://doi.org/10.3390/dj10030042>

Gad, M. M., Fouda, S. M., Abualsaud, R., Alshahrani, F. A., Al-Thobity, A. M., Khan, S. Q., Akhtar, S., Ateeq, I. S., Helal, M. A., & Al-Harbi, F. A. (2022). Strength and Surface Properties of a 3D-Printed Denture Base Polymer. *Journal of Prosthodontics*, 31(5), 412–418. <https://doi.org/10.1111/jopr.13413>

Hada, T., Kanazawa, M., Iwaki, M., Arakida, T., & Soeda, Y. (2020). Effect of printing direction on the accuracy of 3D-printed dentures using stereolithography technology. *Materials*.



UNIVERSITAS
GADJAH MADA

**KEKUATAN TEKAN DAN TEKUK SERTA KETANGGUHAN 3D PRINTED POLY(METHYL
METHACRYLATE) SEBAGAI KANDIDAT
MATERIAL UNTUK BASEPLATE GIGI TIRUAN LENGKAP**

Ananda Firly Nugroho, Dr. Budi Arifvianto, S.T., M.Biotech. ; Dr. Urip Agus Salim, S.T., M.Eng.Sc.
Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Hada, T., Kanazawa, M., Iwaki, M., Katheng, A., & Minakuchi, S. (2021). Comparison of Mechanical

Properties of PMMA Disks for Digitally Designed Dentures. *Polymers*, 13(11), 1745.

<https://doi.org/10.3390/polym13111745>

Hardita, A., Herianti, A., Ismiyati, T., & Sugiyatno, E. (2018). *Gigi tiruan lengkap kerangka logam sebagai alternatif perawatan pasien dengan refleks muntah*. <https://doi.org/10.22146/mkgk.61408>

Herzog, D., Seyda, V., Wycisk, E., & Emmelmann, C. (2016). Additive manufacturing of metals. *Acta Materialia*, 117, 371–392. <https://doi.org/10.1016/j.actamat.2016.07.019>

Hikmah, A. (2015). *Pengujian Bending Biomaterial Hidroksiapatit Dari Tulang Sapi sebagai Prosthesys Sendi Rahang(TMJ) pada manusia*.

Hiromori, K., Fujii, K., & Inoue, K. (2000). Viscoelastic properties of denture base resins obtained by underwater test. *Journal of Oral Rehabilitation*, 27(6), 522–531. <https://doi.org/10.1046/j.1365-2842.2000.00545.x>

Hu, F., Pei, Z., & Wen, Y. (2019). Using Intraoral Scanning Technology for Three-Dimensional Printing of Kennedy Class I Removable Partial Denture Metal Framework: A Clinical Report: 3D Printing Metal Framework. *Journal of Prosthodontics*, 28(2), e473–e476. <https://doi.org/10.1111/jopr.12712>

Itjingningsih, W. H. (1996). *Geligi Tiruan Lengkap Lepas*.

Iwaki, M., Kanazawa, M., Arakida, T., & Minakuchi, S. (2020). Mechanical properties of a polymethyl methacrylate block for CAD/CAM dentures. *Journal of Oral Science*, 62(4), 420–422. <https://doi.org/10.2334/josnusd.19-0448>

Koike, T., Ishizaki, K., Ogami, K., Ueda, T., & Sakurai, K. (2011). Influence of anterior palatal coverage on perception and retention in complete dentures. *The Journal of Prosthetic Dentistry*, 105(4), 272–279. [https://doi.org/10.1016/S0022-3913\(11\)60043-7](https://doi.org/10.1016/S0022-3913(11)60043-7)

Kovan, V. (2008). An assessment of impact strength of the mandible. *Journal of Biomechanics*, 41(16), 3488–3491. <https://doi.org/10.1016/j.jbiomech.2008.09.026>

Lassila, L. V. J., & Vallittu, P. K. (2001). Denture base polymer Alldent Sinomer[®]: Mechanical properties, water sorption and release of residual compounds. *Journal of Oral Rehabilitation*, 28(7), 607–613.



UNIVERSITAS
GADJAH MADA

**KEKUATAN TEKAN DAN TEKUK SERTA KETANGGUHAN 3D PRINTED POLY(METHYL
METHACRYLATE) SEBAGAI KANDIDAT
MATERIAL UNTUK BASEPLATE GIGI TIRUAN LENGKAP**

Ananda Firly Nugroho, Dr. Budi Arifvianto, S.T., M.Biotech. ; Dr. Urip Agus Salim, S.T., M.Eng.Sc.

Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

<https://doi.org/10.1046/j.1365-2842.2001.00733.x>

Lee, J., Belles, D., Gonzalez, M., Kiat-amnuay, S., Dugarte, A., & Ontiveros, J. (2022). Impact Strength of 3D-Printed and Conventional Heat-Cure and Cold-Cure Denture Base Acrylic Resins. *The International Journal of Prosthodontics*, 35(2), 240–244. <https://doi.org/10.11607/ijp.7246>

Lin, C. -T., Lee, S. -Y., Tsai, T. -Y., Dong, D. -R., & Shih, Y. -H. (2000). Degradation of repaired denture base materials in simulated oral fluid. *Journal of Oral Rehabilitation*, 27(3), 190–198.
<https://doi.org/10.1046/j.1365-2842.2000.00513.x>

Lubis, S., & Sutanto, D. (2014). Pengaturan Orientasi Posisi Objek pada Proses x Rapid Prototyping Menggunakan 3D Printer Terhadap Waktu Proses dan Kwalitas Produk. *Jurnal Teknik Mesin*.

Madhav, V. N. V., & Daule, R. (2013). Rapid Prototyping and its Application in Dentistry. *Journal of Dental and Allied Sciences*, 2(2), 57. <https://doi.org/10.4103/2277-4696.159285>

Malacarne, J., Carvalho, R. M., De Goes, M. F., Svizer, N., Pashley, D. H., Tay, F. R., Yiu, C. K., & Carrilho, M. R. D. O. (2006). Water sorption/solubility of dental adhesive resins. *Dental Materials*, 22(10), 973–980. <https://doi.org/10.1016/j.dental.2005.11.020>

Marcenes, W. (2020). *GBD 2017 oral disorders collaborators. Global, regional, and national levels and trends in burden of oral conditions from 1990 to 2017: A systematic analysis for the global burden of disease 2017 study*. 362–373.

Marin, E., Boschetto, F., Zanocco, M., Honma, T., Zhu, W., & Pezzotti, G. (2021). Explorative study on the antibacterial effects of 3D-printed PMMA/nitrides composites. *Materials & Design*, 206, 109788.
<https://doi.org/10.1016/j.matdes.2021.109788>

McCabe, J. F. & Walls, A. W. (2008). *Applied Dental Materials* (Ninth Edition). Blackwell Munksgaard.

McCabe, J. F., & Rusby, S. (2004). Water absorption, dimensional change and radial pressure in resin matrix dental restorative materials. *Biomaterials*, 25(18), 4001–4007.
<https://doi.org/10.1016/j.biomaterials.2003.10.088>

Melchels, F. P., Feijen, J., & Grijpma, D. W. (2010). *A review on stereolithography and its applications in biomedical engineering*. *Biomaterials*, 31(24), 6121-6130.