

DAFTAR PUSTAKA

- Baikie, T., Fang, Y., Kadro, J. M., Schreyer, M., Wei, F., Mhaisalkar, S. G., Graetzel, M., & White, T. J. (2013). Synthesis and crystal chemistry of the hybrid perovskite (CH₃NH₃)PbI₃ for solid-state sensitised solar cell applications. *Journal of Materials Chemistry A*, 1(18), 5628. <https://doi.org/10.1039/c3ta10518k>
- Brivio, F., Frost, J. M., Skelton, J. M., Jackson, A. J., Weber, O. J., Weller, M. T., Goñi, A. R., Leguy, A. M. A., Barnes, P. R. F., & Walsh, A. (2015). Lattice dynamics and vibrational spectra of the orthorhombic, tetragonal, and cubic phases of methylammonium lead iodide. *Physical Review B*, 92(14), 144308. <https://doi.org/10.1103/PhysRevB.92.144308>
- Chan, C. Y., Wang, Y., Wu, G. W., & Wei-Guang Diao, E. (2016). Solvent-extraction crystal growth for highly efficient carbon-based mesoscopic perovskite solar cells free of hole conductors. *Journal of Materials Chemistry A*, 4(10), 3872–3878. <https://doi.org/10.1039/c6ta00912c>
- Chen, Z., Deutsch, T. G., Dinh, H. N., Domen, K., Emery, K., Forman, A. J., Gaillard, N., Garland, R., Heske, C., Jaramillo, T. F., Kleiman-Shwarsstein, A., Miller, E., Takanabe, K., & Turner, J. (2013). *Incident Photon-to-Current Efficiency and Photocurrent Spectroscopy* (hlm. 87–97). https://doi.org/10.1007/978-1-4614-8298-7_7
- Cullity, B. D., & Stock, S. R. (2001). *Elements of X-ray Diffraction*. Prentice Hall.
- Dharmadasa, I. M., Rahaq, Y., Ojo, A. A., & Alanazi, T. I. (2019). Perovskite solar cells: a deep analysis using current–voltage and capacitance–voltage techniques. *Journal of Materials Science: Materials in Electronics*, 30(2), 1227–1235. <https://doi.org/10.1007/s10854-018-0390-5>

- Diebold, U. (2003). The surface science of titanium dioxide. *Surface Science Reports*, 48(5–8), 53–229. [https://doi.org/10.1016/S0167-5729\(02\)00100-0](https://doi.org/10.1016/S0167-5729(02)00100-0)
- Dieter Weber. (1978). $\text{CH}_3\text{NH}_3\text{PbX}_3$, ein Pb(II)-System mit kubischer Perowskitstruktur / $\text{CH}_3\text{NH}_3\text{PbX}_3$, a Pb(II)-System with Cubic Perovskite Structure. *Zeitschrift für Naturforschung B*, 33(12), 1443–1445.
- Dileep, R., Kesavan, G., Reddy, V., Rajbhar, M. K., Shanmugasundaram, S., Ramasamy, E., & Veerappan, G. (2019). Room-temperature curable carbon cathode for hole-conductor free perovskite solar cells. *Solar Energy*, 187, 261–268. <https://doi.org/10.1016/j.solener.2019.05.045>
- Duan, M., Hu, Y., Mei, A., Rong, Y., & Han, H. (2018). Printable carbon-based hole-conductor-free mesoscopic perovskite solar cells: From lab to market. *Materials Today Energy*, 7, 221–231. <https://doi.org/10.1016/j.mtener.2017.09.016>
- Efendi, Z., & Astuti, S. (2016). Pengaruh Suhu Aktivasi terhadap Morfologi dan Jumlah Pori Karbon Aktif Tempurung Kemiri sebagai Elektroda. *Jurnal Fisika Unand*. *Jurnal Fisika Unand*.
- Fatimah, S., Ragadhita, R., Husaeni, D. F. Al, & Nandiyanto, A. B. D. (2021). How to Calculate Crystallite Size from X-Ray Diffraction (XRD) using Scherrer Method. *ASEAN Journal of Science and Engineering*, 2(1), 65–76. <https://doi.org/10.17509/ajse.v2i1.37647>
- Fatmizal, M. N. Z., Rosi, M., & Ismardi, A. (2021). Fabrikasi Elektroda Karbon Aktif dengan Metoda Deposisi Elektroforesis. *Jurnal e-Proceeding of Engineering*, 1–6.
- Green, M. A. (2023). Silicon solar cells step up. *Nature Energy*, 8(8), 783–784. <https://doi.org/10.1038/s41560-023-01296-7>
- Gümüş, E., Yağımlı, M., & Arca, E. (2023). Investigation of the Dielectric Properties of Graphite and Carbon Black-Filled Composites as

- Electromagnetic Interference Shielding Coatings. *Applied Sciences*, 13(15), 8893. <https://doi.org/10.3390/app13158893>
- Halim, L. (2022). Analisis Teknis dan Biaya Investasi Pemasangan PLTS On Grid dan Off Grid di Indonesia. *RESISTOR (Elektronika Kendali Telekomunikasi Tenaga Listrik Komputer)*, 5(2), 131. <https://doi.org/10.24853/resistor.5.2.131-136>
- Hatala, M., Gemeiner, P., Hvojník, M., & Mikula, M. (2019). The effect of the ink composition on the performance of carbon-based conductive screen printing inks. *Journal of Materials Science: Materials in Electronics*, 30(2), 1034–1044. <https://doi.org/10.1007/s10854-018-0372-7>
- Hossain, I. M., Hudry, D., Mathies, F., Abzieher, T., Moghadamzadeh, S., Rueda-Delgado, D., Schackmar, F., Bruns, M., Andriessen, R., Aernouts, T., Di Giacomo, F., Lemmer, U., Richards, B. S., Paetzold, U. W., & Hadipour, A. (2019). Scalable Processing of Low-Temperature TiO₂ Nanoparticles for High-Efficiency Perovskite Solar Cells. *ACS Applied Energy Materials*, 2(1), 47–58. <https://doi.org/10.1021/acsaem.8b01567>
- International Energy Agency (IEA). (2021). Share of world total final consumption by source. *IEA50*.
- Jena, S., Tokas, R. B., Thakur, S., & Sahoo, N. K. (2016). Optical properties of electron beam evaporated ZrO₂:10 %SiO₂ thin films: dependence on structure. *Indian Journal of Physics*, 90(8), 951–957. <https://doi.org/10.1007/s12648-016-0831-z>
- Jeon, N. J., Noh, J. H., Kim, Y. C., Yang, W. S., Ryu, S., & Seok, S. Il. (2014). Solvent engineering for high-performance inorganic–organic hybrid perovskite solar cells. *Nature Materials*, 13(9), 897–903. <https://doi.org/10.1038/nmat4014>
- Julismin. (2013). DAMPAK DAN PERUBAHAN IKLIM DI INDONESIA. *Jurnal Geografi*, 5.

- Kajal, P., Lew, J. H., Kanwat, A., Rana, P. J. S., Nutan, G. V., Koh, T. M., Mhaisalkar, S. G., Powar, S., & Mathews, N. (2021). Unveiling the role of carbon black in printable mesoscopic perovskite solar cells. *Journal of Power Sources*, 501, 230019. <https://doi.org/10.1016/j.jpowsour.2021.230019>
- Kementrian ESDM. (2021). *Statistik Ketanagalistrikan Tahun 2020*. Sekretarian Direktorat Jenderal Ketenagalistrikan.
- Kementrian ESDM. (2023). Energi Surya Jadi Tren Global, Menteri ESDM: Indonesia Punya Prospek Positif. *SIARAN PERS NOMOR: 320.Pers/04/SJI/2023*.
- Kementrian Pertahanan Republik Indonesia. (2015). *Buku Putih Pertahanan Indonesia*. Kemhan.
- Kojima, A., Teshima, K., Shirai, Y., & Miyasaka, T. (2009). Organometal Halide Perovskites as Visible-Light Sensitizers for Photovoltaic Cells. *Journal of the American Chemical Society*, 131(17), 6050–6051. <https://doi.org/10.1021/ja809598r>
- Konrad Mertens. (2015). *Photovoltaics— Fundamentals, Technology, and Practice* (2 ed.). Wiley .
- Ku, Z., Rong, Y., Xu, M., Liu, T., & Han, H. (2013). Full Printable Processed Mesoscopic CH₃NH₃PbI₃/TiO₂ Heterojunction Solar Cells with Carbon Counter Electrode. *Scientific Reports*, 3(1), 3132. <https://doi.org/10.1038/srep03132>
- Lee, J.-W., Tan, S., Seok, S. Il, Yang, Y., & Park, N.-G. (2022). Rethinking the A cation in halide perovskites. *Science*, 375(6583). <https://doi.org/10.1126/science.abj1186>
- Legionosuko, T., Madjid, M. A., Asmoro, N., & Samudro, E. G. (2019). Posisi dan Strategi Indonesia dalam Menghadapi Perubahan Iklim guna Mendukung Ketahanan Nasional. *Jurnal Ketahanan Nasional*, 25(3), 295. <https://doi.org/10.22146/jkn.50907>
- Liu, T., Rong, Y., Xiong, Y., Mei, A., Hu, Y., Sheng, Y., Jiang, P., Hou, X., Duan, M., Guan, Y., Hong, L., & Han, H. (2017). Spacer improvement

- for efficient and fully printable mesoscopic perovskite solar cells. *RSC Advances*, 7(17), 10118–10123. <https://doi.org/10.1039/C6RA25347D>
- Liu, T., Xiong, Y., Mei, A., Hu, Y., Rong, Y., Xu, M., Wang, Z., Lou, L., Du, D., Zheng, S., Long, X., Xiao, S., Yang, S., & Han, H. (2019). Spacer layer design for efficient fully printable mesoscopic perovskite solar cells. *RSC Advances*, 9(51), 29840–29846. <https://doi.org/10.1039/c9ra05357c>
- Mei, A., Li, X., Liu, L., Ku, Z., Liu, T., Rong, Y., Xu, M., Hu, M., Chen, J., Yang, Y., Grätzel, M., & Han, H. (2014). A hole-conductor-free, fully printable mesoscopic perovskite solar cell with high stability. *Science*, 345(6194), 295–298. <https://doi.org/10.1126/science.1254763>
- Michael Grätzel. (2001). Photoelectrochemical cells. *nature*, 338–344.
- Mikrajuddin Abdullah, & Khairurrijal. (2009). Review: Karakterisasi Nanomaterial. *Jurnal Nanosains & Nanoteknologi*, 2.
- Ming, Y., Jiang, Y., Li, J., Huang, J., Xiang, P., Qiu, C., & Rong, Y. (2024). Design and upgrade of mesoporous perovskite solar cells. *Chemistry of Inorganic Materials*, 3, 100050. <https://doi.org/10.1016/j.cinorg.2024.100050>
- Nasution, R. H. R., Salsabilla, A., Ridho'i, M. F., & Murniati, R. (2024). Design Smart Installation Household Electricity Using Solar Panels 600 Watts on Grid Capacity. *Jurnal ILMU DASAR*, 25(1), 73. <https://doi.org/10.19184/jid.v25i1.43717>
- Nursam, N. M. (2024). *TEKNOLOGI SEL SURYA GENERASI KETIGA SEBAGAI ENERGI ALTERNATIF MASA DEPAN*. Penerbit BRIN.
- Pan, M., Huang, N., Zhao, X., Fu, J., & Zhong, X. (2013). Enhanced Efficiency of Dye-Sensitized Solar Cell by High Surface Area Anatase-TiO₂-Modified P25 Paste. *Journal of Nanomaterials*, 2013(1). <https://doi.org/10.1155/2013/760685>
- Parida, B., Singh, A., Oh, M., Jeon, M., Kang, J. W., & Kim, H. (2019). Effect of compact TiO₂ layer on structural, optical, and performance characteristics of mesoporous perovskite solar cells. *Materials Today*

- Communications*, 18, 176–183.
<https://doi.org/10.1016/j.mtcomm.2018.12.007>
- Park, J., Kim, J., Yun, H.-S., Paik, M. J., Noh, E., Mun, H. J., Kim, M. G., Shin, T. J., & Seok, S. Il. (2023). Controlled growth of perovskite layers with volatile alkylammonium chlorides. *Nature*, 616(7958), 724–730.
<https://doi.org/10.1038/s41586-023-05825-y>
- Pazoki, M., Cappel, U. B., Johansson, E. M. J., Hagfeldt, A., & Boschloo, G. (2017). Characterization techniques for dye-sensitized solar cells. *Energy & Environmental Science*, 10(3), 672–709.
<https://doi.org/10.1039/C6EE02732F>
- Pemerintah Indonesia. (2007). *Undang Undang (UU) Nomor 30 Tahun 2007 tentang Energi*. Sekretariat Negara Republik Indonesia.
- Pertamina Energy Insititute. (2020). *Pertamina Energy Outlook 2020*. PPIPE&BPPT.
- Politeknik, N. S., & Lhokseumawe, N. (2019). *BUKU TEKNOLOGI PHOTOVOLTAIC Teuku Rihayat Politeknik Negeri Lhokseumawe*.
<https://www.researchgate.net/publication/341909134>
- Potts, S. J., Phillips, C., Claypole, T., & Jewell, E. (2020). The effect of carbon ink rheology on ink separation mechanisms in screen-printing. *Coatings*, 10(10), 1–17. <https://doi.org/10.3390/coatings10101008>
- Sugiyono. (2013). *METODE PENELITIAN KUANTITATIF KUALITATIF DAN R&D*. AFLABETA BANDUNG.
- Qiu, C., Wu, Y., Song, J., Wang, W., & Li, Z. (2022). Efficient Planar Perovskite Solar Cells with ZnO Electron Transport Layer. *Coatings*, 12(12), 1981. <https://doi.org/10.3390/coatings12121981>
- Que, M., Zhang, B., Chen, J., Yin, X., & Yun, S. (2021). Carbon-based electrodes for perovskite solar cells. Dalam *Materials Advances* (Vol. 2, Nomor 17, hlm. 5560–5579). Royal Society of Chemistry.
<https://doi.org/10.1039/d1ma00352f>
- Ren, Y., Zhang, D., Suo, J., Cao, Y., Eickemeyer, F. T., Vlachopoulos, N., Zakeeruddin, S. M., Hagfeldt, A., & Grätzel, M. (2023). Hydroxamic acid

- pre-adsorption raises the efficiency of cosensitized solar cells. *Nature*, 613(7942), 60–65. <https://doi.org/10.1038/s41586-022-05460-z>
- Republik Indonesia. (2017). *Peraturan Presiden No 22 Tahun 2017 tentang Rencana Umum Energi Nasional*. Sekretariat Negara Republik Indonesia.
- Setyono, A. E., & Kiono, B. F. T. (2021). Dari Energi Fosil Menuju Energi Terbarukan: Potret Kondisi Minyak dan Gas Bumi Indonesia Tahun 2020 – 2050. *Jurnal Energi Baru dan Terbarukan*, 2(3), 154–162. <https://doi.org/10.14710/jebt.2021.11157>
- Sidik Boedoyo, M., Pengkajian, B., & Teknologi, P. (2012). *Analisis Ketahanan Energi di Indonesia*. <https://www.researchgate.net/publication/278030823>
- Snaith, H. J. (2013). Perovskites: The Emergence of a New Era for Low-Cost, High-Efficiency Solar Cells. *The Journal of Physical Chemistry Letters*, 4(21), 3623–3630. <https://doi.org/10.1021/jz4020162>
- Solikhah, A. A., & Bramastia, B. (2024). Systematic Literature Review : Kajian Potensi dan Pemanfaatan Sumber Daya Energi Baru dan Terbarukan Di Indonesia. *Jurnal Energi Baru dan Terbarukan*, 5(1), 27–43. <https://doi.org/10.14710/jebt.2024.21742>
- Stranks, S. D., Eperon, G. E., Grancini, G., Menelaou, C., Alcocer, M. J. P., Leijtens, T., Herz, L. M., Petrozza, A., & Snaith, H. J. (2013). Electron-Hole Diffusion Lengths Exceeding 1 Micrometer in an Organometal Trihalide Perovskite Absorber. *Science*, 342(6156), 341–344. <https://doi.org/10.1126/science.1243982>
- Suresh Kumar, N., & Chandra Babu Naidu, K. (2021). A review on perovskite solar cells (PSCs), materials and applications. *Journal of Materiomics*, 7(5), 940–956. <https://doi.org/10.1016/j.jmat.2021.04.002>
- Suthar, D., Chuhadiya, S., Sharma, R., Himanshu, & Dhaka, M. S. (2022). An overview on the role of ZnTe as an efficient interface in CdTe thin film solar cells: a review. *Materials Advances*, 3(22), 8081–8107. <https://doi.org/10.1039/D2MA00817C>

- Tehrani, Z., Korochkina, T., Govindarajan, S., Thomas, D. J., O'Mahony, J., Kettle, J., Claypole, T. C., & Gethin, D. T. (2015). Ultra-thin flexible screen printed rechargeable polymer battery for wearable electronic applications. *Organic Electronics*, 26, 386–394. <https://doi.org/10.1016/j.orgel.2015.08.007>
- Tsai, C.-M., Wu, G.-W., Narra, S., Chang, H.-M., Mohanta, N., Wu, H.-P., Wang, C.-L., & Diau, E. W.-G. (2017). Control of preferred orientation with slow crystallization for carbon-based mesoscopic perovskite solar cells attaining efficiency 15%. *Journal of Materials Chemistry A*, 5(2), 739–747. <https://doi.org/10.1039/C6TA09036B>
- Vasilopoulou, M., Soultati, A., Filippatos, P. P., Mohd Yusoff, A. R. bin, Nazeeruddin, M. K., & Palilis, L. C. (2022). Charge transport materials for mesoscopic perovskite solar cells. Dalam *Journal of Materials Chemistry C* (Vol. 10, Nomor 31, hlm. 11063–11104). Royal Society of Chemistry. <https://doi.org/10.1039/d2tc00828a>
- Verma, A., Martineau, D., Abdolhosseinzadeh, S., Heier, J., & Nüesch, F. (2020). Inkjet printed mesoscopic perovskite solar cells with custom design capability. *Materials Advances*, 1(2), 153–160. <https://doi.org/10.1039/d0ma00077a>
- Wang, C., & Chen, S.-H. (2012). Factors influencing particle agglomeration during solid-state sintering. *Acta Mechanica Sinica*, 28(3), 711–719. <https://doi.org/10.1007/s10409-012-0029-3>
- Wang X, Zhai B, Yang M, Han W, & Shao X. (2013). *Mater* (90 ed., Vol. 112).
- Warembra, R. S., & Betaubun, P. (2018). Analysis of Electrical Properties Using the four point Probe Method. *E3S Web of Conferences*, 73, 13019. <https://doi.org/10.1051/e3sconf/20187313019>
- Wathage, S. C., Song, Z., Phillips, A. B., & Heben, M. J. (2018). Evolution of perovskite solar cells. Dalam *Perovskite Photovoltaics: Basic to Advanced Concepts and Implementation* (hlm. 43–88). Elsevier. <https://doi.org/10.1016/B978-0-12-812915-9.00003-4>

- Xiang, Z., Mei, X., Yan, J., Mo, D., Fu, W., Jin, P., Yang, Y., & Cai, W. (2023). Enhancing performance and stability of CsPbBr₃ perovskite solar cells through environmentally friendly binary solvent fabrication. *Journal of Materials Science: Materials in Electronics*, 34(31), 2101. <https://doi.org/10.1007/s10854-023-11595-0>
- Xu, J., Buin, A., Ip, A. H., Li, W., Voznyy, O., Comin, R., Yuan, M., Jeon, S., Ning, Z., McDowell, J. J., Kanjanaboos, P., Sun, J.-P., Lan, X., Quan, L. N., Kim, D. H., Hill, I. G., Maksymovych, P., & Sargent, E. H. (2015). Perovskite–fullerene hybrid materials suppress hysteresis in planar diodes. *Nature Communications*, 6(1), 7081. <https://doi.org/10.1038/ncomms8081>
- Yusriwandi, E., Taer, E., & Farma, R. (2017). Pembuatan dan Karakterisasi Elektroda Karbon Aktif dengan Karbonisasi dan Aktivasi Bertingkat Menggunakan Gas CO₂ dan Uap Air. *Jurnal Ilmiah Edu Research*, 21–26.
- Zhang C, Li C, Yang J, Cheng Z, Hou Z, Fan Y, & Lin J. (2009). *Langmuir* (Vol. 25).
- Zhang, H., Xiao, J., Shi, J., Su, H., Luo, Y., Li, D., Wu, H., Cheng, Y., & Meng, Q. (2018). Self-Adhesive Macroporous Carbon Electrodes for Efficient and Stable Perovskite Solar Cells. *Advanced Functional Materials*, 28(39). <https://doi.org/10.1002/adfm.201802985>
- Zouhair, S., Clegg, C., Valitova, I., March, S., Jailani, J. M., & Pecunia, V. (2024). Carbon Electrodes for Perovskite Photovoltaics: Interfacial Properties, Meta-analysis, and Prospects. *Solar RRL*, 8(6). <https://doi.org/10.1002/solr.202300929>