References

[1] X. Duan, Y. Wu, and C. M. Lieber, "Semiconductor nanowire growth and integration," *Nature*, vol. 425, no. 6955, p. 274–278, 2003.

[2] C. Thelander, L. Samuelson, M. T. Björk, M. Borgström, K. Deppert, L. F. Feiner, A. Förster, J. Glüsen, U. Gösele, W. Grützmacher, S. G. Korenblit, H. Linke, A. Pfund, L. R. Wallenberg, P. Werner, W. Wegscheider, and L. Wernersson, "Nanowire-based one-dimensional electronics," *Materials Today*, vol. 9, no. 10, p. 28–35, 2006.

[3] P. Yang, R. Yan, and M. Fardy, "Semiconductor nanowire: What's next?" *Nano Letters*, vol. 10, no. 5, p. 1529–1536, 2010.

[4] E. G. Barbagiovanni, D. J. Lockwood, P. J. Simpson, and L. V. Goncharova, "Quantum confinement in si and ge nanostructures," *Journal of Applied Physics*, vol. 111, no. 3, 2012.

[5] G. Pennelli, E. Dimaggio, and A. Masci, "Silicon nanowires: A breakthrough for thermoelectric applications," *Materials*, vol. 14, no. 18, p. 5305, 2021.

[6] T. Movlarooy, "Study of quantum confinement effects in zno nanostructures," *Materials Research Express*, vol. 5, no. 3, p. 035032, 2018.

[7] N. Goswami, N. Tabassum, M. R. Habib, and M. Kabiruzzaman, "Analysis of electron confinement in semiconductor (ge, gan, and zno) quantum nanowires," 2025.

[8] D. J. Carter, M. Puckeridge, B. Delley, and C. Stampfl, "Quantum confinement effects in gallium nitride nanostructures: ab initio investigations," *Nanotechnology*, vol. 20, no. 42, p. 425401, 2009.

[9] E. L. Luna and M. Á. Vidal, "Review of the properties of gan, inn, and their alloys obtained in cubic phase on mgo substrates by plasma-enhanced molecular beam epitaxy," *Crystals*, vol. 14, no. 9, p. 801, 2024.

[10] L. Samuelson, "Self-forming nanoscale devices," *Materials Today*, vol. 6, no. 10, p. 22–31, 2003.

[11] P. Krogstrup and J. Nygård, "Semiconductor nanowire quantum devices," *Nature Reviews Materials*, vol. 2, p. 17035, 2017.

[12] G. Badawy and E. P. Bakkers, "Electronic transport and quantum phenomena in nanowires," *Chemical reviews*, vol. 124, no. 5, pp. 2419–2440, 2024.

[13] C. M. Lieber and P. Yang, "Nanowire nanoscale materials: Synthesis, properties and applications," *MRS Bulletin*, vol. 32, no. 2, p. 99–108, 2007.

[14] Y. Cui and C. M. Lieber, "Functional nanoscale electronic devices assembled using silicon nanowire building blocks," *Science*, vol. 291, no. 5505, p. 851–853, 2001.

[15] X. Peng, F. Tang, and P. Logan, "Band structure of si/ge core–shell nanowires along the [110] direction modulated byexternal uniaxial strain," *Journal of Physics: Condensed Matter*, vol. 23, no. 11, p. 115502, 2011.

[16] M. Heiss and A. F. i Morral, "Fundamental limits in the external quantum efficiency of single nanowire solar cells," *Applied Physics Letters*, vol. 99, no. 26, p. 263102, 2011.

[17] Z. Wu, J. Neaton, and J. C. Grossman, "Quantum confinement and electronic properties of tapered silicon nanowires," *Physical review letters*, vol. 100, no. 24, p. 246804, 2008.

[18] S. A. Dayeh, "Semiconductor nanowires for energy conversion: Photovoltaics and thermoelectrics," *Semiconductor Science and Technology*, vol. 25, no. 2, p. 024004, 2009.

[19] M. Carofiglio, S. Barui, V. Cauda, and M. Laurenti, "Doped zinc oxide nanoparticles: synthesis, characterization and potential use in nanomedicine," *Applied Sciences (Basel, Switzerland)*, vol. 10, no. 15, p. 5194, 2020.

[20] W. Liang, B. D. Yuhas, and P. Yang, "Magnetotransport in co-doped zno nanowires," *Nano letters*, vol. 9, no. 2, pp. 892–896, 2009.

[21] P. J. Mokgolo, T. P. Gumede, R. O. Ocaya, and T. D. Malevu, "Enhancing perovskite solar cells with rare-earth metal doped zinc oxide: A review of electron mobility, stability, and photocarrier recombination," *International Journal of Energy Research*, vol. 2025, no. 1, p. 4240199, 2025.

[22] Y. Zheng, C. Rivas, R. Lake, K. Alam, T. B. Boykin, and G. Klimeck, "Electronic properties of silicon nanowires," *IEEE transactions on electron devices*, vol. 52, no. 6, pp. 1097–1103, 2005.

[23] R. Rurali, "Colloquium: Structural, electronic, and transport properties of silicon nanowires," *Reviews of Modern Physics*, vol. 82, no. 1, pp. 427–449, 2010.

[24] N. S. Mohammad, "Understanding quantum confinement in nanowires: basics, applications and possible laws," *Journal of Physics: Condensed Matter*, vol. 26, no. 42, p. 423202, 2014.

[25] A. Tilke, F. Simmel, H. Lorenz, R. Blick, and J. Kotthaus, "Quantum interference in a one-dimensional silicon nanowire," *Physical Review B*, vol. 68, no. 7, p. 075311, 2003.

[26] Z. Zhong, Y. Fang, W. Lu, and C. M. Lieber, "Coherent single charge transport in molecular-scale silicon nanowire transistors," *arXiv preprint cond-mat/0412756*, 2004.

[27] P. Bandaru and P. Pichanusakorn, "An outline of the synthesis and properties of silicon nanowires," *Semiconductor science and technology*, vol. 25, no. 2, p. 024003, 2010.

[28] A. A. Leonardi, M. J. L. Faro, and A. Irrera, "Silicon nanowires synthesis by metal-assisted chemical etching: A review," *Nanomaterials*, vol. 11, no. 2, p. 383, 2021.

[29] M. Amato, M. Palummo, and S. Ossicini, "Sige nanowires: Structural stability, quantum confinement, and electronic properties," *Physical Review B—Condensed Matter and Materials Physics*, vol. 80, no. 23, p. 235333, 2009.

[30] L. C. Loaiza, L. Monconduit, and V. Seznec, "Si and ge-based anode materials for li-, na-, and k-ion batteries: a perspective from structure to electrochemical mechanism," *Small*, vol. 16, no. 5, p. 1905260, 2020.

[31] Y. Li, G. Wang, M. Akbari-Saatlu, M. Procek, and H. H. Radamson, "Si and sige nanowire for micro-thermoelectric generator: a review of the current state of the art," *Frontiers in Materials*, vol. 8, p. 611078, 2021.

[32] S. Assali, A. Dijkstra, A. Li, S. Koelling, M. Verheijen, L. Gagliano, N. Von Den Driesch, D. Buca, P. Koenraad, J. Haverkort *et al.*, "Growth and optical properties of direct band gap ge/ge0. 87sn0. 13 core/shell nanowire arrays," *Nano letters*, vol. 17, no. 3, pp. 1538–1544, 2017.

[33] Y. Miao, G. Wang, Z. Kong, B. Xu, X. Zhao, X. Luo, H. Lin, Y. Dong, B. Lu, L. Dong *et al.*, "Review of si-based gesn cvd growth and optoelectronic applications," *Nanomaterials*, vol. 11, no. 10, p. 2556, 2021.

[34] L. Fonseca, I. Donmez-Noyan, M. Dolcet, D. Estrada-Wiese, J. Santander, M. Salleras, G. Gadea, M. Pacios, J. Sojo, A. Morata *et al.*, "Transitioning from si to sige nanowires as thermoelectric material in silicon-based microgenerators, nanomaterials 11 (2021) 517."

[35] M. Law, J. Goldberger, and P. Yang, "Semiconductor nanowires and nanotubes," *Annu. Rev. Mater. Res.*, vol. 34, no. 1, pp. 83–122, 2004.

[36] Y.-M. Niquet, C. Delerue, and G. Allan, "Quantum confinement effects in semiconductor nanostructures," *Physical Review B*, vol. 73, no. 16, p. 165319, 2006.

[37] D. Liang and X. P. A. Gao, "Strong tunneling in silicon nanowire field-effect transistors," *Nano Letters*, vol. 9, no. 1, p. 375–380, 2009.

[38] N. Fukata, T. Oshima, K. Murakami, T. Kizuka, T. Tsurui, and S. Ito, "Phonon confinement effect of silicon nanowires synthesized by laser ablation," *Applied physics letters*, vol. 86, no. 21, 2005.

[39] M. Montazeri, A. Wade, M. Fickenscher, H. E. Jackson, L. M. Smith, J. M. Yarrison-Rice, Q. Gao, H. H. Tan, and C. Jagadish, "Photomodulated rayleigh scattering of single semiconductor nanowires: Probing electronic band structure," *Nano letters*, vol. 11, no. 10, pp. 4329–4336, 2011.

[40] M. Ciurea, "Quantum confinement in nanocrystalline silicon," *J. Optoelectron. Adv. Mater.*, vol. 7, no. 5, pp. 2341–2346, 2005.

[41] X. Peng, F. Tang, and P. Logan, "First principles study of si/ge core-shell nanowires-structural and electronic properties," in *Nanowires-Fundamental Research*. IntechOpen, 2011.

[42] J. Ge, S. Han, X. Miao, Y. Sun, and J. Xiao, "Asymmetrical gaussian potential effects on strongly coupled magnetopolaron properties in triangular confinement potential quantum wells," *Coatings*, vol. 12, no. 12, p. 1900, 2022.

[43] J. Parravicini, F. D. Trapani, M. D. Nelson, Z. T. Rex, R. D. Beiter, T. Catelani, M. F. Acciarri, A. Podesta, C. Lenardi, S. O. Binetti *et al.*, "Quantum confinement in the spectral response of n-doped germanium quantum dots embedded in an amorphous si layer for quantum dot-based solar cells," *ACS Applied Nano Materials*, vol. 3, no. 3, pp. 2813–2821, 2020.