

REFERENCES

- [1] M. Grätzel, “Perspectives for Dye-sensitized Nanocrystalline Solar Cells”, *Progress in Photovoltaics: Research and Applications*, 8 (2000) 171-185.
- [2] D. Wei, P. Andrew and T. Ryhänen, “Electrochemical photovoltaic cells – review of recent developments”, *Journal of Chemistry Technology and Biotechnology*, 85 (2010) 1547-1552.
- [3] Q. Yu, Y. Wang, Z. Yi, N. Zu, J. Zhang, M. Zhang and P. Wang, “High-Efficiency Dye-Sensitized Solar Cells: The Influence of Lithium Ions on Exciton Dissociation, Charge Recombination, and Surface States”, *American Chemical Society Nano*, 4 (2010) 6032-6038.
- [4] S. J. Fonash, *Solar cell Device Physics* 2nd edition, Academic Press is an imprint of Elsevier, UK, (2010).
- [5] J. KRÜGER, “Interface engineering in solid-state dye-sensitized solar cells”, *Pour L'obtention Du Grade De Docteur Ès Sciences*, Department of Chemistry at the École Polytechnique Fédérale de Lausanne (EPFL), (2003).
- [6] B. Li, L. Wang, B. Kang, P. Wang and Y. Qiu, “Review of recent progress in solid-state dye-sensitized solar cells”, *Solar Energy Materials & Solar Cells*, 90 (2006) 549-573.
- [7] J. Xia and S. Yanagida, “Strategy to improve the performance of dye-sensitized solar cells: Interface engineering principle”, *Solar Energy*, (in press) (2009).

- [8] L. Isac, I. Popovici, A. Enesca and A. Duta, “Copper Sulfide (Cu_xS) Thin Films as Possible p-Type Absorbers in 3D Solar Cells”, *Energy Procedia*, 2 (2010) 71–78.
- [9] K. D. Yuan, J. J. Wu, M. L. Liu, L. L. Zhang, F. F. Xu, L. D. Chen, and F. Q. Huang, “Fabrication and microstructure of p-type transparent conducting CuS thin film and its application in dye-sensitized solar cell”, *Applied Physics Letters* 93 (2008), 132106-1 – 132106-3.
- [10] T. Thongtem, A. Phuruangrat and S. Thongtem, “Formation of CuS with flower-like, hollow spherical, and tubular structures using the solvothermal-microwave process”, *Current Applied Physics*, 9 (2009) 195–200.
- [11] T. Thongtem, Ch. Pilapong and S. Thongtem, “Large-scale synthesis of CuS hexaplates in mixed solvents using a solvothermal method”, *Materials Letters*, 64 (2010) 111–114.
- [12] C. -H. Chao, C. -H. Chan, J. -J. Huang, L. -S. Chang and H. -C. Shih, “Manipulated the band gap of 1D ZnO nano-rods array with controlled solution concentration and its application for DSSCs”, *Current Applied Physics*, 11 (2011) S136-S139.
- [13] P. Suri , and R.M. Mehra, “Effect of electrolytes on the photovoltaic performance of a hybrid dye sensitized ZnO solar cell”, *Solar Energy Materials and Solar Cells*, 91 (2007) 518-524.
- [14] E. D. Naturwissenschaften, “Photoelectrochemical Characterization of Dye-Modified ZnO Hybrid Thin Films Prepared by Electrochemical Deposition”, Dr. rer. nat., Institut für Angewandte Physik der Justus Liebig-Universität Gießen, von Kazuteru Nonomura aus Gifu, (2006).

- [15] J. Halme, "Dye-sensitized nanostructured and organic photovoltaic cells: technical review and preliminary tests", Master's thesis, Department of Engineering Physics and Mathematics, Helsinki University of Technology, (2002).
- [16] K. Kalyanasundaram and M. Grätzel, "Applications of functionalized transition metal complexes in photonic and optoelectronic devices", *Coordination Chemistry Reviews*, 77 (1998) 347-414.
- [17] A. Hagfeldt and M. Grätzel, "Light-Induced Redox Reactions in Nanocrystalline Systems", *Chemical Reviews*, 95 (1995) 49-68.
- [18] S. Hazebroucq, F. Labat, D. Lincot, and C. Adamo, "Theoretical Insights on the Electronic Properties of Eosin Y, an Organic Dye for Photovoltaic Applications", *Journal of Physical Chemistry*, 112 (2008) 7264-7270.
- [19] Wikipedia. 2010. "Eosin". [Online]. Available: <http://en.wikipedia.org/wiki/Eosin> (2011, April 15).
- [20] [Online]. Available: http://www.chemicaland21.com/specialtychem/finechem/EOSIN_Y_FREE_ACID.htm (2011, March 30).
- [21] A. Kay, M. Grätzel, "Low cost photovoltaic modules based on dye sensitized nanocrystalline titanium dioxide and carbon powder", *Solar Energy Materials and Solar Cells*, 44 (1996) 99-117.
- [22] H. Pettersson, T. Gruszecki, "Long-term stability of low-power dye-sensitised solar cells prepared by industrial methods", *Solar Energy Materials and Solar Cells*, 70 (2001) 203-212.

- [23] S. Rani, P. K. Shishodia, and R. M. Mehra, "Development of a dye with broadband absorbance in visible spectrum for an efficient dye-sensitized solar cell", *Journal of Renewable and Sustainable Energy*, 2 (2010) 043103-1-043103-8.
- [24] K. Tennakone, G. R. R. A. Kumara, A. R. Kumarasinghe, K. G. U. Wijayantha and P. M. Sirimanne, "A dye-sensitized nano-porous solid-state photovoltaic cell", *Semiconductor Science and Technology*, 10(1995) 1689-1693.
- [25] V.P.S. Perera, K. Tennakone, "Recombination processes in dye-sensitized solid-state solar cells with CuI as the hole collector", *Solar Energy Materials & Solar Cells* 79 (2003) 249–255.
- [26] U. Bach, D. Lupo, P. Comte, J.E. Moser, F. Weissortel, J. Salbeck, H. Spreitzer and M. Grätzel, "Solid-state dye-sensitized mesoporous TiO₂ solar cells with high photon-to-electron conversion efficiencies", *Nature* 395 (1998) 583.
- [27] H. Matsui, K. Okadaa, T. Kawashima, T. Ezure, N. Tanabe, R. Kawano and M. Watanabe, "Application of an ionic liquid-based electrolyte to a 100mm × 100mm sized dye-sensitized solar cell", *Journal of Photochemistry and Photobiology A: Chemistry* 164 (2004) 129–135.
- [28] S. Murai, S. Mikoshiba, H. Sumino and S. Hayase, "Quasi-solid dye-sensitized solar cells containing chemically cross-linked gel How to make gels with a small amount of gelator", *Journal of Photochemistry and Photobiology A: Chemistry* 148 (2002) 33–39.

- [29] J. E. Benedetti, A. D. Gonçalves, A. L. B. Formiga, M-A. D. Paoli, Z. Li, J. R. Durrant and A. F. Nogueira, “A polymer gel electrolyte composed of a poly(ethylene oxide) copolymer and the influence of its composition on the dynamics and performance of dye-sensitized solar cells”, *Journal of Power Sources*, 195 (2010) 1246–1255.
- [30] S. Agarwala, L. N. S. A. Thummalakunta, C. A. Cook, C. K. N. Peh, A. S. W. Wong, L. Ke and G.W. Ho, “Co-existence of LiI and KI in filler-free, quasi-solid-state electrolyte for efficient and stable dye-sensitized solar cell”, *Journal of Power Sources*, 196 (2011) 1651–1656.
- [31] Z. Huo, S. Dai, K. Wang, F. Kong, C. Zhang, X. Pan, X. Fang, “Nanocomposite gel electrolyte with large enhanced charge transport properties of an I_3^-/I^- redox couple for quasi-solid-state dye-sensitized solar cells”, *Solar Energy Materials & Solar Cells*, 91 (2007) 1959–1965.
- [32] K. -C. Huang, P. -Y. Chen, R. Vittal and K. -C. Ho, “Enhanced performance of a quasi-solid-state dye-sensitized solar cell with aluminum nitride in its gel polymer electrolyte”, *Solar Energy Materials & Solar Cells*, 95 (2011) 1990–1995.
- [33] J. Y. Kim, T. H. Kim, D.Y. Kim, N. -G. Park and K. -D. Ahn, “Novel thixotropic gel electrolytes based on dicationic bis-imidazolium salts for quasi-solid-state dye-sensitized solar cells”, *Journal of Power Sources*, 175 (2008) 692–697.
- [34] M. -S. Kang, K. -S. Ahn and J. -W. Lee, “Quasi-solid-state dye-sensitized solar cells employing ternary component polymer-gel electrolytes”, *Journal of Power Sources*, 180 (2008) 896–901.

- [35] Z. Lan, J. Wu, J. Lin and M. Huang, “Quasi-solid-state dye-sensitized solar cells with a novel efficient absorbent for liquid electrolyte based on PAA–PEG hybrid”, *Journal of Power Sources*, 164 (2007) 921–925.
- [36] Y. –H. Lai, C. –W. Chiu, J. –G. Chen, C. –C. Wang, J. –J. Lin, K. –F. Lin and K. –C. Ho, “Enhancing the performance of dye-sensitized solar cells by incorporating nanosilicate platelets in gel electrolyte”, *Solar Energy Materials & Solar Cells*, 93 (2009) 1860–1864.
- [37] Wikipedia. 2010. “Welding” [Online]. Available:
<http://en.wikipedia.org/wiki/Welding> (2010, January 21).
- [38] Wikipedia. 2010. “Welding power supply”. [Online]. Available:
http://en.wikipedia.org/wiki/Welding_power_supply (2010, January 21).
- [39] Wikipedia. 2010. “Arc welding”. [Online]. Available:
http://en.wikipedia.org/wiki/Arc_welding (2010, January 21).
- [40] N. Abdenouri, G. Flamant, J. M. Badie, R. Berjoan, and R. A. Belghit, “Separation of Gold from Sulfide Using a Plasma ArcFuming Process”, *Plasma Chemistry and Plasma Processing*, 19[2] (1999) 171-189.
- [41] Y. Makino, T. Mori, H. Eguchi, H. Saito, B. Kyoh and S. Miyake, “Preferentially oriented anatase nano - powder densified by pulsed high current heating”, *Journal of Materials Science Letters*, 22 (2003) 403– 405.
- [42] P. Singjai , T. Jintakosol, S. Singkarat and S. Choopun, “Luminescence property and large-scale production of ZnO nanowires by current heating deposition”, *Materials Science and Engineering B*, 137 (2007) 59-62.
- [43] Wikipedia. 2010. “Copper sulfide”. [Online]. Available:
http://en.wikipedia.org/wiki/Copper_sulfide (2010, January 21).

- [44] R. Blachnik and A. MuÈller, “The formation of Cu_2S from the elements I. Copper used in form of powders”, *Thermochimica Acta*, 361 (2000) 31-52.
- [45] Wikipedia. 2010. “Copper monosulfide”. [Online]. Available: http://en.wikipedia.org/wiki/Copper_monosulfide (2010, January 21).
- [46] Wikipedia. 2011. “ Cu_2S ”. [Online]. Available: <http://en.wikipedia.org/wiki/Cu2S> (2011, April 17).
- [47] Wikipedia. 2011. “Covellite”. [Online]. Available: <http://en.wikipedia.org/wiki/Covellite> (2011, April 18).
- [48] Wikipedia. 2011. “Copper monosulfide”. [Online]. Available: http://en.wikipedia.org/wiki/Copper_monosulfide (2011, April 18).
- [49] Wikipedia. 2011. “Copper(I) sulfide”. [Online]. Available: [http://en.wikipedia.org/wiki/Copper\(I\)_sulfide](http://en.wikipedia.org/wiki/Copper(I)_sulfide) (2011, April 18).
- [50] Wikipedia. 2011. “Chalcocite”. [Online]. Available: <http://en.wikipedia.org/wiki/Chalcocite> (2011, April 18).
- [51] J. and Z. Zhang, “Hydrothermal synthesis and optical properties of CuS nanoplates”, *Materials Letters*, 62 (2008) 2279-2281.
- [52] F. Li, T. Kong, W. Bi, D. Li, Z. Li and X. Huang, “Synthesis and optical properties of CuS nanoplate-based architectures by a solvothermal method”, *Applied Surface Science*, 255 (2009) 6285-6289.
- [53] T. Thongtem, A. Phuruangrat and S. Thongtem, “Synthesis and analysis of CuS with different morphologies using cyclic microwave irradiation”, *Journal of Material Science*, 42(2007) 9316-9323.
- [54] X. Wang, C. Xu and Z. Zhang, “Synthesis of CuS nanorods by one-step reaction”, *Materials Letters*, 60 (2006) 345 - 348.

- [55] J. G. Dunn and C. Muzenda, "Thermal oxidation of covellite (CuS)", *Thermochimica Acta* , 369 (2001) 117-123.
- [56] H.T. Zhang, G. Wu, X.H. Chen, "Controlled synthesis and characterization of covellite (CuS) nanoflakes", *Materials Chemistry and Physics*, 98 (2006) 298-303.
- [57] X.-H.Liao, N.-Y. Chen, S. Xu, S.-B. Yang and J.-J. Zhu, "A microwave assisted heating method for the preparation of copper sulfide nanorods", *Journal of Crystal Growth*, 252 (2003) 593-598.
- [58] S.-Y. Wang, W. Wang and Z.-H. Lu, "Asynchronous-pulse ultrasonic spray pyrolysis deposition of Cu_xS ($x=1, 2$) thin films", *Materials Science and Engineering B*, 103 (2003) 184-188.
- [59] E. Godočíková, P. Baláž, J.M. Criado, C. Real and E. Gock, "Thermal behaviour of mechanochemically synthesized nanocrystalline CuS", *Thermochimica Acta* , 440 (2006) 19-22.
- [60] G. Mao, W. Dong, D. G. Kurth, and H. Mohwald, "Synthesis of Copper Sulfide Nanorod Arrays on Molecular Templates", *Nano Letters*, 4[2](2004) 249-252.
- [61] Y. Wu, C. Wandia, W. Ma, B. Sadtler and A. P. Alivisatos, "Synthesis and Photovoltaic Application of Copper (I) Sulfide Nanocrystals", *Nano Letters*, 8 (2008) 2551-2555.
- [62] L. Isac, I. Popovici, A. Enesca and A. Duta, "Copper Sulfide (Cu_xS) Thin Films as Possible *p*-Type Absorbers in 3D Solar Cells", *Energy Procedia* , 2 (2010) 71-78.

- [63] Wikipedia. 2011. "Aluminium antimonide". [Online]. Available: http://en.wikipedia.org/wiki/Aluminium_antimonide (2011, April 17).
- [64] Massalski, T.B., et al. ,Binary Alloy Phase Diagrams. 2 ed. 1990, ASM Int.: Materials Park, OH.
- [65] C.-M. Park and H.-J. Sohn, "Novel Antimony/Aluminum/Carbon Nanocomposite for High-Performance Rechargeable Lithium Batteries", Chem. Mater, 20 (2008) 3169-3173.
- [66] T. Gandhi, K.S. Raja and M. Misra, "Room temperature electrodeposition of aluminum antimonide compound semiconductor" , Electrochimica Acta, 53 (2008) 7331–7337.
- [67] H. Honda, H. Sakaguchi, Y. Fukuda and T. Esaka, "Anode behaviors of aluminum antimony synthesized by mechanical alloying for lithium secondary battery", Materials Research Bulletin, 38 (2003) 647–656.
- [68] G. Balakrishnan, S. Huang, L. R. Dawson, Y.-C. Xin, P. Conlin, and D. L. Huffaker, "Growth mechanisms of highly mismatched AlSb on a Si substrate", Applied Physics Letters, 86 (2005) 034105.
- [69] R. Pino, Y. Ko and P.S. Dutta, "Adhesion-free growth of AlSb bulk crystals in silica crucibles", Journal of Crystal Growth, 290 (2006) 29–34.
- [70] C. L. Aravinda and W. Freyland, "Nanoscale electrocrystallisation of Sb and the compound semiconductor AlSb from an ionic liquid", Chemistry Communication, (2006) 1703–1705.
- [71] F. S. Denes and S. Manolache, "Macromolecular plasma-chemistry: an emerging field of polymer science", Progress in Polymer Science, 29 (2004) 815–885

- [72] D. Vollath, "Plasma Synthesis of Nanoparticles", KONA, 25 (2007) 39-55.
- [73] D. Vollath, and D. V. Szabó, "The Microwave plasma process – a versatile process to synthesise nanoparticulate materials", Journal of Nanoparticle Research, 8(2006) 417-418.
- [74] A. Irzh, I. Genish, L. Klein, L. A. Solovyov and A. Gedanken, "Synthesis of ZnO and Zn Nanoparticles in Microwave Plasma and Their Deposition on Glass Slides", Langmuir, 26 (8)(2010) 5976–5984.
- [75] Y. R. –Lazcano, H. Martínez, M. C. –Rodríguez and A. N. Rodríguez, "Properties of CuS thin films treated in air plasma", Thin Solid Films, 517 (2009) 5951–5955.
- [76] Q. Zhen, G. M. Kale, W. He and J. Liu, "Microwave Plasma Sintered Nanocrystalline $\text{Bi}_2\text{O}_3\text{-HfO}_2\text{-Y}_2\text{O}_3$ Composite Solid Electrolyte", Chemistry of Materials, 19 (2007) 203-210.
- [77] J. D. Houmes and H. –C. Loyer, "Microwave Synthesis of Ternary Nitride Materials", Journal of Solid State Chemistry, 130 (1997) 266-271.
- [78] N. M. Ravindra, P. Ganapathy and J. Choi, "Energy gap–refractive index relations in semiconductors – An overview", Infrared Physics & Technology, 50 (2007) 21–29.
- [79] T. Siciliano, A. Tepore, E. Filippo, G. Micocci and M. Tepore, "Characteristics of molybdenum trioxide nanobelts prepared by thermal evaporation technique", Materials Chemistry and Physics, 114 (2009) 687–691.
- [80] Data Base, JCPDS-ICDD, 12 Campus Boulevard, Newtown Square, PA 19073–3273, U.S.A. (2001).

- [81] B. Minceva-Sukarova, M. Najdoski, I. Grozdanov, C.J. Chunnillall, “Raman spectra of thin solid films of some metal sulfides”, *Journal of Molecular Structure*, 410-411 (1997) 267-270.
- [82] S. -Y. Wang, W. Wang, Z. -H. Lu, “Asynchronous-pulse ultrasonic spray pyrolysis deposition of Cu_xS ($x=1, 2$) thin films” *Materials Science and Engineering B*, 103 (2003) 184-188.
- [83] J. Zhang, Z. Zhang, “Hydrothermal synthesis and optical properties of CuS nanoplates”, *Materials Letters*, 62 (2008) 2279-2281.
- [84] J. Geng, J.-J. Zhu, H.-Y. Chen, “Sonochemical Preparation of Luminescent PbWO_4 Nanocrystals with Morphology Evolution”, *Crystal Growth & Design*, 6 (2006) 321-326.
- [85] K.W. Andrews, D.J. Dyson, S.R. Keown, *Interpret. Electr. Diffract. Patterns*, Plenum Press, New York, (1971).
- [86] C. Boudias, D. Monceau, *CaRIne Crystallography 3.1*, DIVERGENT S.A., Centre de Transfert, 60200 Comièpgne, France (1989-1998).
- [87] T. Azuhata, T. Sota and K. Suzuki, “Second-order Raman spectra and lattice dynamics in AlAs”, *Journal of Physics: Condensed Matter*, 7 (1995) 1949–1957.
- [88] RRUFF, University of Arizona Mineral Museum 3170, ID: R050654.
- [89] K.W. Andrews, D.J. Dyson and S.R. Keown, *Interpretation of Electron Diffraction Patterns*, Plenum Press, New York (1971).

- [90] T. Thongtem, Ch Pilapong and S. Thongtem, “Solvothelmal synthesis of CdS nanorods using hydroxyethyl cellulose as a template”, *Current Applied Physics*, 9 (2009) 1272–1277.
- [91] A. Phuruangrat, T. Thongtem and S. Thongtem, “Preparation, characterization and photoluminescence of nanocrystalline calcium molybdate”, *Journal of Alloys and Compound*, 481 (2009) 568–572.
- [92] T. Thongtem, A. Phuruangrat and S. Thongtem, “Characterization of nanostructured ZnO produced by microwave irradiation”, *Ceramics International*, 36 (2010) 257–262.
- [93] A. Phuruangrat, T. Thongtem and S. Thongtem, “Characterization of cadmium sulfide nanorods prepared by the solvothelmal process”, *Materials Letters*, 63 (2009) 1562–1565.
- [94] T. Thongtem, Ch. Pilapong and S. Thongtem, “Large-scale synthesis of CuS hexaplates inmixed solvents using a solvothelmal method”, *Materials Letters*, 64 (2010) 111–114.
- [95] Boudias C, Monceau D. *CaRIne Crystallography 3.1*, 17 rue du Moulin du Roy, F-60300 Senlis, France; 1989–1998.
- [96] S. Tsunekawa, T. Fukuda and A. Kasuya, “Blue shift in ultraviolet absorption spectra of monodisperse CeO_{2-x} nanoparticles”, *Journal of Applied Physics*, 87 (2000) 1318–1321.

- [97] N.M. Ravindra, P. Ganapathy and J. Choi, “Energy gap–refractive index relations in semiconductors – An overview”, *Infrared Physics & Technology*, 50 (2007) 21–29.
- [98] M. Li and J.C. Li, “Size effects on the band-gap of semiconductor compounds”, *Materials Letters*, 60 (2006) 2526–2529.
- [99] T. Gandhi, K.S. Raja and M. Misra, “Room temperature electrodeposition of aluminum antimonide compound semiconductor”, *Electrochimica Acta*, 53 (2008) 7331–7337
- [100] Y. Al-Douri, H. Abid and H. Aourag, “Calculation of bulk moduli of semiconductor compounds”, *Physica B*, 322 (2002) 179–182.
- [101] M. Anani, C. Mathieu, S. Lebid, Y. Amar, Z. Chama and H. Abid, “Model for calculating the refractive index of a III–V semiconductor”, *Computational Materials Science*, 41 (2008) 570–575.
- [102] I. Vurgaftman, J.R. Meyer and L.R. Ram-Mohan, “Band parameters for III–V compound semiconductors and their alloys”, *Journal of Applied Physics*, 89 (2001) 5815–5875.
- [103] J.F. Banfield, S.A. Welch, H. Zhang, T.T. Ebert, R.L. Penn, “Aggregation-Based Crystal Growth and Microstructure Development in Natural Iron Oxyhydroxide Biomineralization Products”, *Science*, 289 (2000) 751–754.

- [104] R.L. Penn, J.F. Banfield, “Imperfect Oriented Attachment: Dislocation Generation in Defect-Free Nanocrystals”, *Science*, 281 (1998) 969-971.
- [105] P. Zhang and L. Gao, “Copper sulfide flakes and nanodisks”, *Journal of Materials Chemistry*, 13 (2003) 2007-2010.
- [106] T. –Y. Ding, M. –S. Wang, S. –P. Guo, G. – C. Guo and J. –S Huang, “CuS nanoflowers prepared by a polyol route and their photocatalytic property”, *Materials Letters*, 62 (2008) 4529–4531.
- [107] C. Naşcu, I Pop, V. Ionescu, E. Indrea and I. Bratu, “Spray pyrolysis deposition of CuS thin films”, *Materials Letters*, 32 (1997) 73-77.
- [108] I. Grozdanov, “Optical and Electrical Properties of Copper Sulfide Films of Variable Composition”, *Journal of solid state chemistry*, 114 (1995) 469-475.
- [109] J. Zhang and Z. Zhang, “Hydrothermal synthesis and optical properties of CuS nanoplates”, *Materials Letters*, 62 (2008) 2279–2281.
- [110] A. Hauch and A. Georg, “Diffusion in the electrolyte and charge-transfer reaction at the platinum electrode in dye-sensitized solar cells”, *Electrochimica Acta*, 46 (2001) 3457-3466.
- [111] M. Grätzel, “Conversion of sunlight to electric power by nanocrystalline dye-sensitized solar cells”, *Journal of Photochemistry and Photobiology A: Chemistry*, 164 (2004) 3–14.