

Literaturverzeichnis

- [1] K. Heinloth, *Die Energiefrage*. Braunschweig Wiesbaden: Vieweg, 1997.
- [2] H. G. Brauch, ed., *Energiepolitik*. Berlin Heidelberg: Springer, 1997.
- [3] B. O'Regan and M. Grätzel, "A low-cost, high-efficiency solar cell based on dye-sensitized colloidal TiO_2 films," *Nature*, vol. 353, p. 737, 1991.
- [4] H. Tributsch, *Eine elektrochemische Methode zum Studium der spektralen Sensibilisierung und heterogener photochemischer Reaktionen an ZnO-Elektroden*. Dissertation, Technische Universität München, 1968.
- [5] H. Tributsch and H. Gerischer, "Elektrochemische Untersuchungen über den Mechanismus der Sensibilisierung und Übersensibilisierung an ZnO Einkristallen," *Ber. Bunsenges. Phys. Chem.*, vol. 73, no. 3, p. 251, 1969.
- [6] R. Memming and H. Tributsch, "Electrochemical investigations on the spectral sensitization of gallium phosphide electrodes," *J. Phys. Chem.*, vol. 75, no. 4, p. 562, 1971.
- [7] H. Tributsch, "Reaction of excited chlorophyll molecules at electrodes and in photosynthesis," *Photochem. Photobiol.*, vol. 16, p. 261, 1972.
- [8] H. Tsubomura, M. Matsumura, Y. Nomura, and T. Amamiya, "Dye sensitised zink oxid: aqueous electrolyte: platinum photocell," *Nature*, vol. 261, p. 402, 1976.
- [9] J. Desilvestro, M. Grätzel, L. Kavan, and J. Moser, "Highly efficient sensitization of titanium dioxide," *J. Am. Chem. Soc.*, vol. 107, p. 2988, 1985.
- [10] T. Beardsley, "Bright future for a new photovoltaic cell," *Scientific American*, p. 138, January 1992.
- [11] M. K. Nazeeruddin, A. Kay, I. Rodicio, R. Humphry-Baker, E. Müller, P. Liska, N. Vlachopoulos, and M. Grätzel, "Conversion of light to electricity by *cis*- X_2 -bis(2,2'-bipyridyl-4,4'-dicarboxylate)ruthenium(II) charge-transfer sensitizers ($X = Cl^-$, Br^- , Iod^- , CN^- , and SCN^-) on nanocrystalline TiO_2 electrodes," *J. Am. Chem. Soc.*, vol. 115, p. 6382, 1993.
- [12] M. A. Green, K. Emery, K. Bücher, D. L. King, and S. Igari, "Solar cell efficiency tables (version 11)," *Prog. Photovolt. Res. Appl.*, vol. 6, p. 35, 1998.
- [13] M. A. Green, K. Emery, K. Bücher, D. L. King, and S. Igari, "Solar cell efficiency tables (version 15)," *Prog. Photovolt. Res. Appl.*, vol. 8, p. 187, 2000.

- [14] I. Lauermann, G. Chmiel, L. Dloczik, D. Jestel, A. Kückelhaus, R. Niepmann, and I. Uhendorf, "Dye sensitized solar cells: Stability, efficiency and upscaling," in *14th European Photovoltaic Solar Energy Conference*, (Barcelona, Spain), 1997.
- [15] R. Eichberger and F. Willig, "Ultrafast electron injection from excited dye molecules into semiconductor electrodes," *Chem. Phys.*, vol. 141, p. 159, 1990.
- [16] M. Grätzel in *Semiconductor Nanoclusters — Physical, Chemical, and Catalytic Aspects* (P. V. Kamat and D. Meisel, eds.), Amsterdam: Elsevier, 1997.
- [17] R. Grünwald and H. Tributsch, "Mechanisms of instability in Ru-based dye sensitization solar cells," *J. Phys. Chem. B*, vol. 101, no. 14, p. 2564, 1997.
- [18] O. Kohle, M. Grätzel, A. F. Meyer, and T. B. Meyer, "The photovoltaic stability of bis(isothiocyanato)ruthenium(II)-bis-2,2'-bipyridine-4,4'-dicarboxylic acid and related sensitizers," *Adv. Mater.*, vol. 9, no. 11, p. 904, 1997.
- [19] M. Späth, P. M. Sommeling, J. Wienke, J. A. M. van Roosmalen, W. C. Sinke, A. F. Meyer, T. B. Meyer, and O. Kohle, "Stability of sealed nanocrystalline organic photovoltaik devices," in *14th European Photovoltaic Solar Energy Conference*, (Barcelona, Spain), 1997.
- [20] K. Zweibel, *Harnessing Solar Power*. New York: Plenum Press, 1990.
- [21] A. F. Hollemann and E. Wiberg, *Lehrbuch der Anorganischen Chemie*. Berlin · New York: Walter de Gruyter, 1985.
- [22] H. W. Schock, "Polykristalline Materialien für Dünnschichtsolarzellen," in *Solarzellen* (D. Meissner, ed.), p. 44, Vieweg Verlag, 1993.
- [23] F. H. Karg, "Polykristalline Dünnfilmsolarzellen," in *Solarzellen* (D. Meissner, ed.), p. 100, Vieweg Verlag, 1993.
- [24] D. Bonnet, "Die CdTe/CdS–Dünnschichtsolarzelle," in *Solarzellen* (D. Meissner, ed.), p. 119, Vieweg Verlag, 1993.
- [25] S. K. Ghandi, N. R. Tsakar, and I. B. Bhat, "Arsenic doped p–CdTe layer grown by organometallic vapor phase epitaxy," *Appl. Phys. Lett.*, vol. 50, p. 900, 1987.
- [26] A. L. Fahrenbruch, "Ohmic contacts and doping of CdTe," *Solar Cells*, vol. 21, p. 399, 1987.
- [27] W. Wetling, "Technologie der GaAs–Solarzelle," in *Solarzellen* (D. Meissner, ed.), p. 176, Vieweg Verlag, 1993.
- [28] A. Bett, S. Cardona, A. Ehrhardt, F. Lutz, H. Welter, and W. Wetling in *22. IEEE PVSC*, (Las Vegas), 1991.
- [29] C. Becquerel *Compt. rend. Hebd. Séances Acad. Sci.*, vol. 9, p. 561, 1839.
- [30] S. Morrison, *Electrochemistry at Semiconductor and Oxidized Metal Electrodes*. New York: Plenum Press, 1980.

- [31] Y. Pleskov and Y. Gurevich, *Semiconductor Photoelectrochemistry*. New York: Plenum Publishing Corporation, 1986.
- [32] C. Hamann and W. Vielstich, *Elektrochemie*. Weinheim: VCH Verlagsges., 1985.
- [33] A. Ennaoui, S. Fiechter, C. Pettenkofer, N. Alonso-Vante, K. Büker, M. Bronold, C. Höpfner, and H. Tributsch, “Iron disulfide for solar energy conversion,” *Sol. Energy Mat. Sol. Cells*, vol. 29, p. 289, 1993.
- [34] S. Licht and D. Peramunage, “Efficient photoelectrochemical solar cells from electrolyte modification,” *Nature*, vol. 345, p. 330, 1990.
- [35] B. Parkinson, “On the efficiency and stability of photoelectrochemical devices,” *Acc. Chem. Res.*, vol. 17, p. 431, 1984.
- [36] N. S. Lewis, “Photoeffects at the semiconductor / liquid interface,” *Ann Rev. Mater. Sci.*, vol. 14, p. 95, 1984.
- [37] D. M. Blake, J. Webb, C. Turchi, and K. Magrini, “Kinetic and mechanistic overview of TiO₂–photocatalyzed oxidation reactions in aqueous solution,” *Sol. Energy Mater. Sol. Cells*, vol. 24, p. 584, 1991.
- [38] M. R. Hoffmann, S. T. Martin, W. Choi, and D. W. Bahnemann, “Environmental applications of semiconductor photocatalysis,” *Chem. Rev.*, vol. 95, p. 69, 1995.
- [39] M. Grätzel, “Nanocrystalline thin-film pv cells,” *MRS Bulletin*, vol. October, p. 61, 1993.
- [40] M. Grätzel, “Nanocrystalline ceramic films for efficient conversion of light into electricity,” *J. Sol-Gel Sci. Technol.*, vol. 2, p. 673, 1994.
- [41] L. Kavan, M. Grätzel, S. E. Gilbert, C. Klemenz, and H. J. Scheel, “Electrochemical and photoelectrochemical investigation of single-crystal anatase,” *J. Am. Chem. Soc.*, vol. 118, no. 28, p. 6716, 1996.
- [42] L. Kavan, M. Grätzel, J. Rathousky, and A. Zukal, “Nanocrystalline TiO₂ (anatase) electrodes: Surface morphology, adsorption, and electrochemical properties,” *J. Electrochem. Soc.*, vol. 143, no. 2, p. 394, 1996.
- [43] J. Ferber, R. Stangl, and J. Luther, “On the influence of material parameters on the performance of dye-sensitized solar cells,” in *14th European Photovoltaic Solar Energy Conference*, (Barcelona, Spain), p. 1804, 1997.
- [44] M. Grätzel, “Perspectives for dye-sensitized nanocrystalline solar cells,” *Prog. Photovolt. Res. Appl.*, vol. 8, p. 171, 2000.
- [45] A. Kay, *Solar Cells based on dye-sensitized nanocrystalline TiO₂ electrodes*. Dissertation, EPFL Lausanne, 1994.

- [46] A. Hamnett, M. Dare-Edwards, R. Wright, K. Seddon, and J. Goodenough, "Photossensitisation of titanium(iv) oxide with tris(2,2'-bipyridine)ruthenium(ii) chloride. surface states of titanium(iv) oxide," *J. Phys. Chem.*, vol. 83, no. 25, p. 3280, 1979.
- [47] M. Dare-Edwards, J. Goodenough, A. Hamnett, K. Seddon, and R. Wright, "Sensitization of semiconducting electrodes with ruthenium-based dyes," *Faraday Discuss. Chem. Soc.*, vol. 70, p. 285, 1981.
- [48] C. von Planta, *Die photoelektrische Charakterisierung der mit Farbstoff sensibilisierten nanokristallinen Solarzellen*. Dissertation, EPFL Lausanne, 1996.
- [49] A. J. Mc Evoy and M. Grätzel, "Sensitization in photochemistry and photovoltaics," *Sol. Energy Mater. Sol. Cells*, vol. 32, p. 221, 1994.
- [50] R. Amadelli, R. Argazzi, C. A. Bignozzi, and F. Scandola, "Design of antenna-sensitizer polynuclear complexes. sensitization of titanium dioxide with $[\text{Ru}(\text{bpy})_2(\text{CN})_2]_2\text{Ru}(\text{bpy}(\text{COO})_2)_2^{2-}$," *J. Am. Chem. Soc.*, vol. 112, p. 7099, 1990.
- [51] M. Nazeeruddin, P. Liska, J. Moser, N. Vlachopoulos, and M. Grätzel, "Conversion of light to electricity with trinuclear ruthenium complexes adsorbed on textured TiO_2 films," *Helv. Chim. Acta*, vol. 73, p. 1788, 1990.
- [52] A. Kay and M. Grätzel, "Artificial photosynthesis. photosensitization of TiO_2 solar cells with chlorophyll derivatives and related natural porphyrins," *J. Phys. Chem.*, vol. 97, p. 6272, 1993.
- [53] C. A. Bignozzi, R. Argazzi, M. T. Indelli, and F. Scandola, "Design of supramolecular systems for spectral sensitization of semiconductors," *Sol. Energy Mater. Sol. Cells*, vol. 32, p. 229, 1994.
- [54] O. Kohle, S. Ruile, and M. Grätzel, "Ruthenium(II) charge-transfer sensitizers containing 4,4'-dicarboxy-2,2'-bipyridine. synthesis, properties, and bonding mode of coordinated thio- and selenocyanates," *Inorg. Chem.*, vol. 35, no. 16, p. 4779, 1996.
- [55] A. Kay and M. Grätzel, "Low cost photovoltaic modules based on dye sensitized nanocrystalline titanium dioxide and carbon powder," *Sol. Energy Mater. Sol. Cells*, vol. 44, p. 99, 1996.
- [56] A. Hagfeldt and M. Grätzel, "Molecular photovoltaics," *Acc. Chem. Res.*, vol. 33, p. 269, 2000.
- [57] M. K. Nazeeruddin, P. Pechy, and M. Grätzel, "Efficient panchromatic sensitization of nanocrystalline TiO_2 films by a black dye based on a trithiocyanato-ruthenium complex," *Chem. Comm.*, p. 1075, 1997.
- [58] N. Papageorgiou, W. F. Maier, and M. Grätzel, "An iodine/triiodide reduction electrocatalyst for aqueous and organic media," *J. Electrochem. Soc.*, vol. 144, no. 3, p. 876, 1997.

- [59] S. Y. Huang, G. Schlichthörl, J. Nozik, M. Grätzel, and A. Frank, “Charge recombination in dye-sensitized nanocrystalline TiO_2 solar cells,” *J. Phys. Chem. B*, vol. 101, p. 2576, 1997.
- [60] W. J. Albery and P. N. Bartlett, “The transport and kinetics of photogenerated carriers in colloidal semiconductor electrode particles,” *J. Electrochem. Soc.*, vol. 131, p. 315, 1984.
- [61] A. Solbrand, H. Lindström, H. Rensmo, A. Hagfeldt, and S. E. Lindquist, “Electron transport in the nanostructured TiO_2 –elektrolyte system studied with time resolved photocurrents,” *J. Phys. Chem. B*, vol. 101, p. 2514, 1997.
- [62] F. Cao, G. Oskam, G. J. Meyer, and P. C. Searson, “Electron transport in porous nanocrystalline TiO_2 photoelectrochemical cells,” *J. Phys. Chem.*, vol. 100, p. 17021, 1996.
- [63] B. O’Regan, J. Moser, M. Anderson, and M. Grätzel, “Vectorial electron injection into transparent semiconductor membranes and electric field effects on the dynamics of light-induced charge separation,” *J. Phys. Chem.*, vol. 94, p. 8720, 1990.
- [64] B. Enright and D. Fitzmaurice, “Spectroscopic determination of electron and hole effective masses in a nanocrystalline semiconductor film,” *J. Phys. Chem.*, vol. 100, p. 1027, 1996.
- [65] R. Könenkamp, R. Henninger, and P. Hoyer, “Photocarrier transport in colloidal TiO_2 -films,” *J. Phys. Chem.*, vol. 97, p. 7328, 1993.
- [66] P. Hoyer and H. Weller, “Potential-dependent electron injection in nanoporous colloidal ZnO films,” *J. Phys. Chem.*, vol. 99, p. 14096, 1995.
- [67] Y. Liu, A. Hagfeldt, X.-R. Xiao, and S.-E. Lindquist, “Investigation of influence of redox species on the interfacial energetics of a dye-sensitized nanoporous TiO_2 solar cell,” *Sol. Energy Mater. Sol. Cells*, vol. 55, p. 267, 1998.
- [68] A. Zaban, A. Meier, and B. A. Gregg, “Electric potential distribution and short-range screening in nanoporous TiO_2 electrodes,” *J. Phys. Chem. B*, vol. 101, p. 7985, 1997.
- [69] K. Schwarzburg and F. Willig, “Origin of photovoltage and photocurrent in the nanoporous dye-sensitized electrochemical solar cell,” *J. Phys. Chem. B*, vol. 103, no. 28, p. 5743, 1999.
- [70] R. Grünwald, *In-situ Infrarot spektrokopische Untersuchungen an Grenzflächen photoelektrochemischer Solarzellen*. Dissertation, Freie Universität Berlin, 1996.
- [71] M. Fotteler, *Untersuchung zeitabhängiger Zellprozesse in nanokristallinen farbstoffsensibilisierten Solarzellen*. Diplomarbeit, Albert-Ludwigs-Universität Freiburg, 1997.

- [72] S. Södergren, A. Hagfeldt, J. Olsson, and S.-E. Lindquist, “Theoretical models for the action spectrum and the current-voltage characteristics of microporous semiconductor films in photoelectrochemical cells,” *J. Phys. Chem.*, vol. 98, p. 5552, 1994.
- [73] A. Hagfeldt and M. Grätzel, “Light-induced redox reaktions in nanocrystalline systems,” *Chem. Rev.*, vol. 95, p. 49, 1995.
- [74] P. Debye and H. Falkenhagen *Phys. Z.*, vol. 29, p. 401, 1928.
- [75] W. P. Boeij, M. S. Pshenichnikov, and D. A. Wiersma *J. Phys. Chem.*, vol. 100, p. 11086, 1996.
- [76] S. Passino, Y. Nagasawa, T. Joo, and G. R. Fleming, “Three-pulse echo peak shift studies of polar solvation dynamics,” *J. Phys. Chem. A*, vol. 101, p. 725, 1997.
- [77] G. Smestad, “Testing of dye sensitized TiO₂ solar cells II: Theoretical voltage output and photoluminescence efficiencies,” *Sol. Energy Mat. Solar Cells*, vol. 32, p. 273, 1996.
- [78] S. A. Haque, Y. Tachibana, D. R. Klug, and J. R. Durrant, “Charge recombination kinetics in dye-sensitized nanocrystalline titanium dioxide films under externally applied bias,” *J. Phys. Chem. B*, vol. 102, p. 1745, 1998.
- [79] T. Meyer, *Solid State Nanocrystalline Titanium Oxide Photovoltaic Cells*. Dissertation, EPFL Lausanne, 1996.
- [80] M. Matsumoto, H. Miyazaki, K. Matsuhiro, Y. Kumashiro, and Y. Takaoka, “A dye sensitized TiO₂ photoelectrochemical cell constructed with polymer solid electrolyte,” *Solid State Ionics*, vol. 89, p. 263, 1996.
- [81] U. Bach, D. Lupo, P. Comte, J. E. Moser, F. Weissörtel, J. Salbeck, T. Spreitzer, and M. Grätzel, “Solid-state dye-sensitized mesoporous TiO₂ solar cells with high photon-to-electron conversion efficiencies,” *Nature*, vol. 395, p. 583, 1998.
- [82] K. Tennakone, G. Senadeera, V. Perera, I. Kottekoda, and L. De Silva, “Dye-sensitized photoelectrochemical cells based on porous SnO₂/ZnO composite and TiO₂ films with a polymer electrolyte,” *Chem. Mater.*, vol. 11, p. 2474, 1999.
- [83] A. Hauch, *Diffusion und Grenzflächenreaktion an der Platinenelektrode in farbstoff-sensibilisierten Solarzellen*. Diplomarbeit, Albert-Ludwigs-Universität Freiburg, 1998.
- [84] J. Hagen, *Technische Katalyse*. Weinheim: VCH Verlag, 1996.
- [85] I. Lauermann, “Persönliche Mitteilung.”
- [86] M. Turrión, B. Macht, P. Salvador, and H. Tributsch, “Imaging techniques for the study of photodegradation of dye sensitization cells,” *Z. Phys. Chem.*, vol. 212, p. 51, 1999.

- [87] P. Salvador, M. Chaparro, and A. Mir, “Digital imaging of the effect of photoetching on the photoresponse of n-type tungsten diselenide and molybdenum diselenide single crystal electrodes,” *J. Phys. Chem.*, vol. 100, p. 760, 1996.
- [88] W. D. Perkins, “Fourier Transform Infrared Spectroscopy — Part I. Instrumentation,” *J. Chem. Educ.*, vol. 63, no. 1, p. A 5, 1986.
- [89] W. D. Perkins, “Fourier Transform Infrared Spectroscopy — Part II. Advantages of FTIR,” *J. Chem. Educ.*, vol. 64, no. 11, p. A 269, 1987.
- [90] J. W. Cooley and J. W. Tukey, “An algorithm for machine calculation of complex Fourier series,” *Math. Comp.*, vol. 19, p. 297, 1965.
- [91] R. J. Bell, *Introductory Fourier Transform Spectroscopy*. San Diego: Academic Press, 1972.
- [92] J. E. Chamberlain, *The Principles of Interferometric Spectroscopy*. Chichester: Wiley Interscience, 1979.
- [93] H. Günzler and H. Böck, *IR-Spektroskopie*. Weinheim: Verlag Chemie, 1975.
- [94] B. Schrader, ed., *Infrared and Raman Spectroscopy — Methods and Applications*. Weinheim: VCH Verlag, 1995.
- [95] W. D. Perkins, “Fourier Transform Infrared Spectroscopy — Part III. Applications,” *J. Chem. Educ.*, vol. 64, p. A 296, 1987.
- [96] N. J. Harrick, *Internal Reflection Spectroscopy*. New York: Interscience Publishers, 1967.
- [97] F. M. Mirabella, “Internal reflection spectroscopy,” *Applied Spectroscopy Reviews*, vol. 21, p. 45, 1985.
- [98] R. Grünwald, “Persönliche Mitteilung.”
- [99] P. W. Atkins, *Physikalische Chemie*. Weinheim: VCH, 1990.
- [100] *Powder Diffraction File*. International Center for Diffraction Data, 1991.
- [101] D. Matthews, A. Kay, and M. Grätzel, “Electrophoretically deposited titanium dioxide thin films for photovoltaic cells,” *Aust. J. Chem.*, vol. 47, p. 1869, 1994.
- [102] R. Rosenhauer, *Präparation und elektrochemische Charakterisierung nanokristalliner Titandioxid- und Zinkoxidschichten*. Diplomarbeit, Freie Universität Berlin, 1998.
- [103] Q. Xu and A. Anderson, “Synthesis of porosity controlled ceramic membranes,” *J. Mater. Res.*, vol. 6, no. 5, p. 1073, 1991.
- [104] M. A. Anderson, M. J. Gieselmann, and Q. Xu, “Titania and alumina ceramic membranes,” *J. Membrane Sci.*, vol. 392, p. 43, 1988.

- [105] C. Barbé, F. Arendse, P. Comte, M. Jirousek, F. Lenzmann, V. Shklover, and M. Grätzel, “Nanocrystalline titanium oxide electrodes for photovoltaic applications,” *J. Am. Ceram. Soc.*, vol. 80, no. 12, p. 3157, 1997.
- [106] *CD Römpf Chemie Lexikon – Version 1.0*. Stuttgart / New York: Georg Thieme Verlag, 1995.
- [107] K. Kalyanasundaram and M. Grätzel, “Photovoltaic performance of injection solar cells and other applications of nanocrystalline oxide layers,” *Proc. Indian Acad. Sci. (Chem. Sci.)*, vol. 109, no. 6, p. 447, 1997.
- [108] B. Benkö, M. Hilgendorff, A. P. Yartsev, and V. Sundström, “Electron injection and recombination in fluorescein 27-sensitized TiO₂ thin films,” *J. Phys. Chem. B*, vol. 105, no. 5, p. 967, 2001.
- [109] *Surlyn Ionomere — Übersichtsbroschüre*. Du Pont.
- [110] Z. Kebede and S.-E. Lindquist, “The obstructed diffusion of the I₃⁻ ion in mesoscopic TiO₂ membranes,” *Solar Energy Materials and Solar Cells*, vol. 51, p. 293, 1998.
- [111] T. Trupke and P. Würfel in *Quantum Solar Energy Conversion*, (Selva Gardena (Italy)), 2000.
- [112] A. B. Meinel and M. P. Meinel, *Applied Solar Energy*. Addison-Wesley Publishing Company, 1976.
- [113] S. Y. Huang, L. Kavan, I. Exnar, and M. Grätzel *J. Elektrochem. Soc.*, vol. 142, p. L142, 1995.
- [114] S. Y. Huang, L. Kavan, A. Kay, M. Grätzel, and I. Exnar *Active and Passive Elec. Comp.*, vol. 19, p. 23, 1995.
- [115] B. Macht, M. Turrión, A. Barkschat, P. Salvador, K. Ellmer, and H. Tributsch, “Patterns of efficiency and degradation in dye sensitization solar cells measured with imaging techniques,” *Sol. Energy Mater. Sol. Cells*, vol. 72, p. 163, 2002.
- [116] M. Grätzel, “Persönliche Mitteilung an H. Tributsch.”
- [117] A. Barkschat, B. Macht, M. Turrión, K. Ellmer, and H. Tributsch, “Photodegradation of *cis*-Ru(LH₂)₂(NCS)₂ in dye sensitization solar cells,” in *Thirteenth International Conference on Photochemical Conversion and Storage of Solar Energy (IPS 2000)*, (Snowmass/Aspen, Colorado), 2000.
- [118] C. Morterra, “An infrared spectroscopic study of anatase properties,” *J. Chem. Soc., Faraday Trans. 1*, vol. 84, no. 5, p. 1617, 1988.
- [119] K. S. Finnie, J. R. Barlett, and J. L. Woolfrey, “Vibrational spectroscopic study of the coordination of (2,2'-bipyridyl-4,4'-dicarboxylic acid)ruthenium(II) complexes to the surface of nanocrystalline titania,” *Langmuir*, vol. 14, no. 10, p. 2744, 1998.

- [120] K. Vinodgopal, X. Hua, R. Dahlgren, A. Lappin, L. Patterson, and P. Kamat, “Photochemistry of Ru(bpy)₂(bpc)²⁺ on Al₂O₃ and TiO₂ surfaces. an insight into the mechanism of photosensitization,” *J. Phys. Chem.*, vol. 99, p. 10883, 1995.
- [121] P. Falaras and M. Grätzel, “Dye sensitization of TiO₂ surfaces studied by raman spectroscopy,” *J. Electrochem. Soc.*, vol. 140, no. 6, p. L92, 1993.
- [122] N. W. Duffy, K. D. Dobson, K. C. Gordon, B. H. Robinson, and A. J. McQuillan, “In situ infrared spectroscopic analysis of the adsorption of ruthenium(II) bipyridyl dicarboxylic acid photosensitizers to TiO₂ in aqueous solutions,” *Chem. Phys. Lett.*, vol. 266, p. 451, 1997.
- [123] A. Hugot-Le Goff and P. Falaras, “Origin of new bands in raman spectra of dye monolayers adsorbed on nanocrystalline TiO₂,” *J. Electrochem. Soc.*, vol. 142, no. 3, p. L 38, 1995.
- [124] R. H. Herber, G. Nan, J. A. Potenza, H. J. Schugar, and A. Bino, “Ru(2,2'-bpy)₂(NCS)₂ ·X [X = CH₃CN, (CH₃)₂SO] and related compounds: Crystal structure, VFTTIR, and NMR study,” *Inorg. Chem.*, vol. 28, p. 938, 1989.
- [125] K. Murakoshi, G. Kano, Y. Wada, S. Yanagida, H. Miyazaki, M. Matsumoto, and S. Murasawa, “Importance of binding states between photosensitizing molecules and the TiO₂ surface for efficiency in a dye-sensitized solar cell,” *J. Electroanal. Chem.*, vol. 396, p. 27, 1995.
- [126] R. Argazzi, C. A. Bignozzi, T. A. Heimer, F. N. Castellano, and G. J. Meyer, “Enhanced spectral sensitivity from ruthenium(II) polypyridyl based photovoltaic devices,” *Inorg. Chem.*, vol. 33, p. 5741, 1994.
- [127] T. Lopez, E. Sanchez, P. Bosch, Y. Meas, and R. Gomez, “FTIR and UV-Vis (diffuse reflectance) spectroscopic characterization of TiO₂ sol-gel,” *Mat. Chem. Phys.*, vol. 32, no. 2, p. 141, 1992.
- [128] M. Hesse, H. Meier, and B. Zeeh, *Spektroskopische Methoden in der organischen Chemie*. Stuttgart: Thieme, 3 ed., 1987.
- [129] K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*. New York: John Wiley & Sons, 3rd ed., 1978.
- [130] H. Rensmo, *Dye-Sensitized Nanostructured Metal Oxide Elektrodes*. Uppsala: Acta Universitatis Upsaliensis, 1998.
- [131] H. Tributsch, “Persönliche Mitteilung.”

Literaturverzeichnis
