

Literaturverzeichnis

- [Arn71] J.A. Arnaud, W.M. Hubbard, G.D. Mandeville, B. de la Clavière, E.A. Franke und J.M. Franke. “Technique for fast measurement of gaussian laser beam parameters”. *Appl. Opt.* 10: 2775–2776 (1971)
- [Ash97] D. Ashkenasi, H. Varel, A. Rosenfeld, F. Noack und E.E.B. Campbell. “Pulse-width influence on laser structuring of dielectrics”. *Nucl. Instr. Meth. Phys. Res. B* 122: 359–363 (1997)
- [Bas72] M. Bass und H.H. Barrett. “Avalanche breakdown and the probabilistic nature of laser-induced damage”. *IEEE J. Quant. Electron.* QE-8: 338–343 (1972)
- [Bau99] S. Baudach, J. Bonse und W. Kautek. “Ablation experiments on polyimide with femtosecond laser pulses”. *Appl. Phys. A* 69: S395–S398 (1999)
- [Bäu00] D. Bäuerle. *Laser processing and chemistry*. 3. Aufl. (Springer, Berlin Heidelberg, 2000)
- [Bei99] F. Beinhorn, J. Ihlemann, P. Simon, G. Marowsky, B. Maisenhölder, J. Edlinger, D. Neuschäfer und D. Anselmetti. “Sub-micron grating formation in Ta_2O_5 -waveguides by femtosecond UV-laser ablation”. *Appl. Surf. Sci.* 138-139: 107–110 (1999)
- [Beu90] T. Beuermann, H.J. Brinkmann, T. Damm und M. Stuke. “Picosecond UV excimer laser ablation of $LiNbO_3$ ”. *Mat. Res. Soc. Symp. Proc.* 191: 37–42 (1990)
- [Bli73] E.S. Bliss, D. Milam und R.A. Bradbury. “Dielectric mirror damage by laser radiation over a range of pulse durations and beam radii”. *Appl. Opt.* 12(4): 677–689 (1973)
- [Blo73] N. Bloembergen. “Role of cracks, pores, and absorbing inclusions on laser induced damage threshold at surfaces of transparent dielectrics”. *Appl. Opt.* 12(4): 661–664 (1973)
- [Blo74] N. Bloembergen. “Laser-induced electric breakdown in solids”. *IEEE J. Quant. Electron.* QE-10: 375–386 (1974)
- [Bon00] J. Bonse, P. Rudolph, J. Krüger, S. Baudach und W. Kautek. “Femtosecond pulse laser processing of TiN on silicon”. *Appl. Surf. Sci.* 154-155: 659–663 (2000)

- [Bon01a] J. Bonse, S. Baudach, J. Krüger, W. Kautek, K. Starke, T. Gross, D. Ristau, W.G. Rudolph, J.C. Jasapara und E. Welsch. “Femtosecond laser damage in dielectric coatings”. In *Laser-Induced Damage in Optical Materials: 2000* (G.J. Exarhos, A.H. Guenther, M.R. Kozlowski, K.L. Lewis und M.J. Soileau, Hg.), Proc. SPIE Vol. 4347, 24–34 (2001)
- [Bon01b] J. Bonse, J.M. Wrobel, J. Krüger und W. Kautek. “Ultrashort-pulse laser ablation of Indium Phosphide in air”. *Appl. Phys. A* 72: 89–94 (2001)
- [Bon02] J. Bonse, S. Baudach, J. Krüger, W. Kautek und M. Lenzner. “Femtosecond laser ablation of silicon—modification thresholds and morphology”. *Appl. Phys. A* 74: 19–25 (2002)
- [Bor88] Z. Bor. “Distortion of femtosecond laser pulses in lenses and lens systems”. *J. Mod. Opt.* 35(12): 1907–1918 (1988)
- [Bro91] I.N. Bronstein und K.A. Semendjajew. *Taschenbuch der Mathematik*. 25. Aufl. (B.G. Teubner Verlagsgesellschaft, Stuttgart · Leipzig und Verlag Nauka, Moskau, 1991)
- [Coh83] A.J. Cohen und G.G. Janezic. “Relationships among trapped hole and trapped electron centers in oxidized soda-silica glasses of high purity”. *Phys. Status Solidi A* 77: 619–624 (1983)
- [Coo82] L. Cook und K.H. Mäder. “Ultraviolet transmission characteristics of a fluorophosphate laser glass”. *J. Am. Ceram. Soc.* 65: 597–601 (1982)
- [Cos02] F. Costache, M. Henyk und J. Reif. “Modification of dielectric surfaces with ultra-short laser pulses”. *Appl. Surf. Sci.* 186: 352–357 (2002)
- [Dau04] F. Dausinger, F. Lichtner und H. Lubatschowski (Hg.) *Femtosecond technology for technical and medical applications*. Nr. 96 in Topics in Applied Physics (Springer, Berlin Heidelberg, 2004)
- [Dav96] K.M. Davis, K. Miura, N. Sugimoto und K. Hirao. “Writing waveguides in glass with femtosecond laser”. *Opt. Lett.* 21(21): 1729–1731 (1996)
- [DeS73] L.G. DeShazer, B.E. Newnam und K.M. Leung. “Role of coating defects in laser-induced damage to dielectric thin films”. *Appl. Phys. Lett.* 23(11): 607–609 (1973)
- [Dic04] J.T. Dickinson, S. Orlando, S.M. Avanesyan und S.C. Langford. “Color center formation in soda lime glass and NaCl single crystals with femtosecond laser pulses”. *Appl. Phys. A* 79: 859–864 (2004)
- [Die85] J.C.M. Diels, J.J. Fontaine, I.C. McMichael und F. Simoni. “Control and measurement of ultrashort pulse shapes (in amplitude and phase) with femtosecond accuracy”. *Appl. Opt.* 24(9): 1270–1282 (1985)

- [Die96] J.C. Diels und W. Rudolph. *Ultrashort laser pulse phenomena* (Academic Press, San Diego, 1996)
- [DIN99] DIN EN ISO 11146. *Laser und Laseranlagen — Prüfverfahren für Laserstrahlparameter — Strahlabmessungen, Divergenzwinkel und Strahlpropagationsfaktoren* (1999)
- [DIN01] DIN EN ISO 11254-2. *Laser und Laseranlagen — Bestimmung der laserinduzierten Zerstörschwelle optischer Oberflächen — Teil 2: S-auf-1-Prüfung* (2001)
- [Efi98] O.M. Efimov, K. Gabel, S.V. Garnov, L.B. Glebov, S. Grantham, M. Richardson und M.J. Soileau. “Color-center generation in silicate glasses exposed to infrared femtosecond pulses”. *J. Opt. Soc. Am. B* 15(1): 193–199 (1998)
- [Efi99] O.M. Efimov, L.B. Glebov, S. Grantham und M. Richardson. “Photoionization of silicate glasses exposed to IR femtosecond pulses”. *J. Non-Cryst. Solids* 253: 58–67 (1999)
- [Ehr00] D. Ehrt, P. Ebeling und U. Natura. “UV transmission and radiation-induced defects in phosphate and fluoride-phosphate glasses”. *J. Non-Cryst. Solids* 263 & 264: 240–250 (2000)
- [Eva96] E. Eva, K. Mann, N. Kaiser, B. Anton, R. Henking, D. Ristau, P. Weissbrodt, L. Mademann, L. Raupach und E. Hacker. “Laser conditioning of LaF₃/MgF₂ dielectric coatings at 248 nm”. *Appl. Opt.* 35(28): 5613–5619 (1996)
- [Eye87] M. Eyett und D. Bäuerle. “Influence of the beam spot size on the ablation rates in pulsed-laser processing”. *Appl. Phys. Lett.* 51(24): 2054–2055 (1987)
- [Fow68] W.B. Fowler. *Physics of color centers* (Academic Press, New York, 1968)
- [Fra73] D.W. Fradin, N. Bloembergen und J.P. Letellier. “Dependence of laser-induced breakdown field strength on pulse duration”. *Appl. Phys. Lett.* 22(12): 635–637 (1973)
- [Giu72] C.R. Giuliano. “Laser-induced damage in transparent dielectrics: ion beam polishing as a means of increasing surface damage thresholds”. *Appl. Phys. Lett.* 21(1): 39–41 (1972)
- [Gri83] D.L. Griscom, E.J. Friebel, K.J. Long und J.W. Fleming. “Fundamental defect centers in glass: Electron spin resonance and optical absorption studies of irradiated phosphorus-doped silica glass and optical fibers”. *J. Appl. Phys.* 54(7): 3743–3762 (1983)
- [Güd98] J. Gündde, J. Hohlfeld, J.G. Müller und E. Matthias. “Damage threshold dependence on electron-phonon coupling in Au and Ni films”. *Appl. Surf. Sci.* 127-129: 40–45 (1998)

- [Gui96] S. Guizard, P. Martin, G. Petite, P. D’Oliveira und P. Meynadier. “Time-resolved study of laser-induced colour centres in SiO_2 ”. *J. Phys.: Cond. Mat.* 8: 1281–1290 (1996)
- [Hai99] R. Haight, D. Hayden, P. Longo, T. Neary und A. Wagner. “MARS: Femtosecond laser mask advanced repair system in manufacturing”. *J. Vac. Sci. Tech. B* 17(6): 3137–3143 (1999)
- [Hei02] A. Heisterkamp. *Einsatz ultrakurzer Laserpulse in der refraktiven Laserchirurgie*. Dissertation, Universität Hannover (2002)
- [Hen00] M. Henyk, D. Wolfframm und J. Reif. “Ultra short laser pulse induced charged particle emission from wide bandgap crystals”. *Appl. Surf. Sci.* 168: 263–266 (2000)
- [Her04] A. Hertwig, S. Martin, J. Krüger und W. Kautek. “Interaction area dependence of the ablation threshold of ion-doped glass”. *Thin Solid Films* 453-454: 527–530 (2004)
- [Hol72] L.H. Holway, jr. “Temporal behavior of electron distributions in an electric field”. *Phys. Rev. Lett.* 28(5): 280–283 (1972)
- [Hom96] D. Homuelle, S. Wielandy, A.L. Gaeta, N.F. Borelli und C. Smith. “Infrared photosensitivity in silica glasses exposed to femtosecond laser pulses”. *Opt. Lett.* 24(18): 1311–1313 (1996)
- [Hop70] R.W. Hopper und D.R. Uhlmann. “Mechanism of inclusion damage in laser glass”. *J. Appl. Phys.* 41(10): 4023–4037 (1970)
- [Ihl92] J. Ihlemann, B. Wolff und P. Simon. “Nanosecond and femtosecond excimer laser ablation of fused silica”. *Appl. Phys. A* 54: 363–368 (1992)
- [Ito82a] N. Itoh. “Creation of lattice defects by electronic excitation in alkali halides”. *Adv. Phys.* 31(5): 491–551 (1982)
- [Ito82b] N. Itoh und T. Nakayama. “Mechanism of neutral particle emission from electron-hole plasma near solid surface”. *Phys. Lett.* 92A(9): 471–475 (1982)
- [Jee88] Y. Jee, M.F. Becker und R.M. Walser. “Laser-induced damage on single-crystal metal surfaces”. *J. Opt. Soc. Am. B* 5(3): 648–659 (1988)
- [Jon89] S.C. Jones, P. Bräunlich, R.T. Casper und X.-A. Shen. “Recent progress on laser-induced modifications and intrinsic bulk damage of wide-gap optical materials”. *Opt. Eng.* 28(10): 1039–1068 (1989)
- [Kem93] M. Kempe und W. Rudolph. “Femtosecond pulses in the focal region of lenses”. *Phys. Rev. A* 48(6): 4721–4729 (1993)

- [Kim00] B.M. Kim, M.D. Feit, A.M. Rubenchick, E.J. Joslin, J. Eichler, P.C. Stoller und L.B. da Silva. “Effects of high repetition rate and beam size on hard tissue damage due to subpicosecond laser pulses”. *Appl. Phys. Lett.* 76(26): 4001–4003 (2000)
- [Kno78] M.L. Knotek und P.J. Feibelman. “Ion desorption by core-hole Auger decay”. *Phys. Rev. Lett.* 40(14): 964–967 (1978)
- [Kön01] K. König, I. Riemann und W. Fritzsche. “Nanodissection of human chromosomes with near-infrared femtosecond laser pulses”. *Opt. Lett.* 26(11): 819–821 (2001)
- [Kor99] F. Korte, S. Nolte, B.N. Chichkov, T. Bauer, G. Kamlage, T. Wagner, C. Fallnich und H. Welling. “Far-field and near-field material processing with femtosecond laser pulses”. *Appl. Phys. A* 69: S7–S11 (1999)
- [Krü99] J. Krüger. *Ultrakurze Laserimpulse in der Mikromaterialbearbeitung*. Dissertation, Brandenburgische Technische Universität Cottbus (1999)
- [Krü03] J. Krüger, M. Lenzner, S. Martin, M. Lenner, C. Spielmann, A. Fiedler und W. Kautek. “Single- and multi-pulse femtosecond laser ablation of optical filter materials”. *Appl. Surf. Sci.* 208-209: 233–237 (2003)
- [Lay] “Material data of BK7 Schott glass”. <http://www.layertec.de/bk7.html>
- [Len98] M. Lenzner, J. Krüger, S. Sartania, Z. Cheng, C. Spielmann, G. Mourou, W. Kautek und F. Krausz. “Femtosecond Optical Breakdown in Dielectrics”. *Phys. Rev. Lett.* 80(18): 4076–4079 (1998)
- [Len99a] M. Lenzner, J. Krüger, W. Kautek und F. Krausz. “Incubation of laser ablation in fused silica with 5-fs pulses”. *Appl. Phys. A* 69: 465–466 (1999)
- [Len99b] M. Lenzner, J. Krüger, W. Kautek und F. Krausz. “Precision laser ablation of dielectrics in the 10-fs regime”. *Appl. Phys. A* 68: 369–371 (1999)
- [Len04] M. Lenner. *Interaction of intense femtosecond laser pulses with absorbing materials*. Dissertation, Technische Universität Wien (2004)
- [Li02] B.C. Li, S. Martin und E. Welsch. “Laser conditioning and nonlinear absorption of LaF_3/MgF_2 multilayers at 193 nm”. *Appl. Phys. A* 74: 27–33 (2002)
- [Lin97] D. von der Linde, K. Sokolowski-Tinten und J. Bialkowski. “Laser-solid interaction in the femtosecond time regime”. *Appl. Surf. Sci.* 109-110: 1–10 (1997)
- [Liu82] J.M. Liu. “Simple technique for measurement of pulsed gaussian-beam spot sizes”. *Opt. Lett.* 7(5): 196–198 (1982)
- [Lon03] J.B. Lonzaga, S.M. Avanesyan, S.C. Langford und J.T. Dickinson. “Color center formation in soda-lime glass with femtosecond laser pulses”. *J. Appl. Phys.* 94(7): 4332–4340 (2003)

- [Mac66] J.H. Mackey, H.L. Smith und A. Halperin. “Optical studies in x-irradiated high purity sodium silicate glasses”. *J. Phys. Chem. Solids* 27: 1759–1772 (1966)
- [Mai60] T.H. Maiman. “Stimulated optical radiation in ruby”. *Nature* 187: 493–494 (1960)
- [Mai66] M. Maier, W. Kaiser und J.A. Giordmaine. “Intense light bursts in the stimulated Raman effect”. *Phys. Rev. Lett.* 17(26): 1275–1277 (1966)
- [Mar03] S. Martin, A. Hertwig, M. Lenzner, J. Krüger und W. Kautek. “Spot size dependence of the ablation threshold in dielectrics for femtosecond laser pulses”. *Appl. Phys. A* 77: 883–884 (2003)
- [Mer03] M. Mero, J. Liu, A. Sabbah, J. Jasapara, K. Starke, D. Ristau, J.K. McIver und W.G. Rudolph. “Femtosecond pulse damage and pre-damage behavior of dielectric thin films”. In *Laser-Induced Damage in Optical Materials: 2002* (G. Exarhos, A. Guenther, N. Kaiser, K. Lewis, M. Soileau C. Stolz, A. Giesen und H. Weber, Hg.), Proc. SPIE Vol. 4932, 202–215 (2003)
- [Mos01] M. Mosbacher, H.J. Münzer, J. Zimmermann, J. Solis, J. Boneberg und P. Leiderer. “Optical field enhancement effects in laser-assisted particle removal”. *Appl. Phys. A* 72: 41–44 (2001)
- [Mün02] H.J. Münzer, M. Mosbacher, M. Bertsch, O. Dubbers, A. Pack, R. Wannemacher, B.U. Runge, D. Bäuerle und P. Leiderer. “Optical Near Field Effects in Surface Nanostructuring and Laser Cleaning”. In *Second International Symposium on Laser Precision Microfabrication* (I. Miyamoto, Y.F. Lu, K. Sugioka und J.J. Dubowski, Hg.), Proc. SPIE Vol. 4426, 180–183 (2002)
- [Niem95] M.H. Niemz. “Threshold dependence of laser-induced optical breakdown on pulse duration”. *Appl. Phys. Lett.* 66(10): 1181–1183 (1995)
- [Nol97] S. Nolte, C. Momma, H. Jacobs, A. Tünnermann, B.N. Chichkov, B. Wellegenhagen und H. Welling. “Ablation of metals by ultrashort laser pulses”. *J. Opt. Soc. Am. B* 14(10): 2716–2722 (1997)
- [O'D64] J.J. O'Dwyer. *The theory of dielectric breakdown of solids* (Clarendon, New York, Oxford, 1964)
- [Pet97] G. Petite, P. Daguzan, S. Guizard und P. Martin. “Ultrafast processes in laser irradiated wide bandgap insulators”. *Appl. Surf. Sci.* 109-110: 36–42 (1997)
- [Pre93] S. Preuss, M. Späth, Y. Zhang und M. Stuke. “Time resolved dynamics of subpicosecond laser ablation”. *Appl. Phys. Lett.* 62(23): 3049–3051 (1993)
- [Qué01] F. Quéré, S. Guizard und P. Martin. “Time-resolved study of laser-induced breakdown in dielectrics”. *Europhys. Lett.* 56(1): 138–144 (2001)

- [Ret04] B. Rethfeld, K. Sokolowski-Tinten, D. von der Linde und S.I. Anisimov. “Timescales in the response of materials to femtosecond laser excitation”. *Appl. Phys. A* 79: 767–769 (2004)
- [Sai00] K. Saito und A.J. Ikushima. “Absorption edge in silica glass”. *Phys. Rev. B* 62(13): 8584–8587 (2000)
- [Sch62] J.H. Schulman und W.D. Compton. *Color centers in solids* (Pergamon Press, Oxford, 1962)
- [Sch04] H. Schwörer. “Generation of x-rays by intense femtosecond lasers”. In *Femtosecond technology for technical and medical applications* (F. Dausinger, F. Lichtenher und H. Lubatschowski, Hg.), Nr. 96 in Topics in Applied Physics, 237–255 (Springer, Berlin Heidelberg, 2004)
- [Sim89] P. Simon, H. Gerhardt und S. Szatmári. “Intensity-dependent loss properties of window materials at 248 nm”. *Opt. Lett.* 14(21): 1207–1209 (1989)
- [Spe91] D.E. Spence, P.N. Kean und W. Sibbett. “60-fsec pulse generation from a self-mode-locked Ti:sapphire laser”. *Opt. Lett.* 16(1): 42–44 (1991)
- [Sto00a] R. Stoian. *Investigations of the dynamics of material removal in ultrashort pulsed laser ablation of dielectrics*. Dissertation, Freie Universität Berlin (2000)
- [Sto00b] R. Stoian, D. Ashkenasi, A. Rosenfeld und E.E.B. Campbell. “Coulomb explosion in ultrashort pulsed laser ablation of Al_2O_3 ”. *Phys. Rev. B* 62: 13167–13173 (2000)
- [Str85] D. Strickland und G. Mourou. “Compression of amplified chirped optical pulses”. *Opt. Commun.* 56(3): 219–221 (1985)
- [Stu95] B.C. Stuart, M.D. Feit, A.M. Rubenchik, B.W. Shore und M.D. Perry. “Laser-induced damage in dielectrics with ns to ps pulses”. *Phys. Rev. Lett.* 74(12): 2248–2251 (1995)
- [Stu96] B.C. Stuart, M.D. Feit, S. Herman, A.M. Rubenchik, B.W. Shore und M.D. Perry. “Optical ablation by high-power short-pulse lasers”. *J. Opt. Soc. Am. B* 13(2): 459–468 (1996)
- [Tan83] K. Tanimura, T. Tanaka und N. Itoh. “Creation of quasistable lattice defects by electronic excitation in SiO_2 ”. *Phys. Rev. Lett.* 51(5): 423–426 (1983)
- [Tau66] J. Tauc, R. Grigoni und A. Vancu. “Optical properties and electronic structure of amorphous germanium”. *phys. stat. sol.* 15: 627–637 (1966)
- [Tay88] A.J. Taylor, R.B. Gibson und J.P. Roberts. “Two-photon absorption at 248 nm in ultraviolet window materials”. *Opt. Lett.* 13(10): 814–816 (1988)

- [Tie99] A.C. Tien, S. Backus, H. Kapteyn, M. Murnane und G. Mourou. “Short-pulse laser damage in transparent materials as a function of pulse duration”. *Phys. Rev. Lett.* 82(19): 3883–3886 (1999)
- [Var96] H. Varel, D. Ashkenasi, A. Rosenfeld, R. Herrmann, F. Noack und E.E.B. Campbell. “Laser-induced damage in SiO_2 and CaF_2 with picosecond and femtosecond laser pulses”. *Appl. Phys. A* 62: 293–294 (1996)
- [Web67] H.P. Weber. “Method for pulselwidth measurement of ultrashort light pulses generated by phase-locked lasers using nonlinear optics”. *J. Appl. Phys.* 38(5): 2231–2234 (1967)
- [Wel94] E. Welsch, K. Mann, M. Reichling und K. Ettrich. “Time and frequency resolved investigation of thin film laser damage”. In *Laser-Induced Damage in Optical Materials: 1993* (H.E. Bennett, L.L. Chase, A.H. Guenther, B.E. Newnam und M.J. Soileau, Hg.), Proc. SPIE Vol. 2114, 366–380 (1994)
- [Wer03] O. Werhahn, A. Schirmacher, M. Schmiedel, E. Sutter, A. Nevezina-Sturhan, H. Lecher, U. Siegner, G. Ott und M. Janßen. *Laserschutzfilter für den ns- und fs-Bereich*. Nr. Fb 1003 in Schriftenreihe der Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, Dortmund Berlin Dresden, 2003)
- [Wil78] R.T. Williams, J.N. Bradford und W.L. Faust. “Short-pulse studies of exciton relaxation and F-center formation in NaCl , KCl , and NaBr ”. *Phys. Rev. B* 18(12): 7038–7057 (1978)
- [Wil87] P. Williams und G. Gillen. “Direct evidence for coulombic ejection of electron-desorbed ions”. *Surf. Sci.* 180: L109–L112 (1987)
- [Wil89] R.T. Williams. “Optically generated lattice defects in halide crystals”. *Opt. Eng.* 28(10): 1024–1033 (1989)
- [Woo86] R.M. Wood. *Laser damage in optical materials*. The Adam Hilger series on optics and optoelectronics (Adam Hilger, Bristol, 1986)
- [Yab72] E. Yablonovitch und N. Bloembergen. “Avalanche ionization and the limiting diameter of filaments induced by light pulses in transparent media”. *Phys. Rev. Lett.* 29(14): 907–910 (1972)
- [Zew88] A.H. Zewail. “Laser femtochemistry”. *Science* 242: 1645–1653 (1988)
- [Zum85] G. Zumofen, A. Blumen und J. Klafter. “Concentration fluctuations in reaction kinetics”. *J. Chem. Phys.* 82(7): 3198–3206 (1985)