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Nota di contenuto	Laser Welding of Plastics; Contents; Introduction; 1 Material Properties of Plastics; 1.1 Formation and Structure; 1.2 Types of Plastics; 1.2.1 Thermoplastic Resins; 1.2.1.1 Amorphous Thermoplastics; 1.2.1.2 Semicrystalline Thermoplastics; 1.2.2 Elastomers; 1.2.3 Thermosets; 1.2.4 Polymer Compounds; 1.2.4.1 Polymer Blends; 1.2.4.2

Copolymers; 1.2.4.3 Thermoplastic Elastomers; 1.2.5 Polymer Composites; 1.3 Thermal Properties; 1.3.1 Phase Transitions; 1.3.1.1 Glass Transition (Tg); 1.3.1.2 Flow Temperature (Tf); 1.3.1.3 Crystallite Melting Temperature (Tm); 1.3.1.4 Thermal Decomposition (Td)
1.3.2 Specific Volume1.3.3 Heat Capacity; 1.3.4 Heat Conduction; 1.3.5 Temperature Conduction; 1.3.5.1 Amorphous Thermoplastics; 1.3.5.2 Semicrystalline Thermoplastics; 1.4 Optical Properties; 1.4.1 Optical Constants; 1.4.2 Reflection, Transmission and Absorption Behavior; 1.4.3 Scattering of NIR- and IR-Radiation in Plastics; 1.4.4 Absorption of NIR-Laser Radiation (= 800 nm to 1200 nm); 1.4.4.1 Electronic Excitation; 1.4.4.2 Vibronic Excitation; 1.4.4.3 Summarizing Comment; 1.4.5 Absorption of NIR-Laser Radiation (= 1200 nm to 2500 nm)
1.4.6 Absorption of MIR-Laser Radiation (= 2.5 mm to 25 m)1.4.7 Adaptation of NIR-Radiation Absorption by Additives; 1.4.7.1 Carbon Black; 1.4.7.2 Inorganic Pigments; 1.4.7.3 Organic Dyes; 1.4.7.4 Summarizing Comment; References; 2 Laser Sources for Plastic Welding; 2.1 Properties of Laser Radiation; 2.1.1 Laser Wavelength; 2.1.2 Intensity Distribution; 2.1.3 Beam Propagation; 2.1.4 Focusing Properties; 2.2 Types of Lasers; 2.2.1 Diode Lasers (800 to 2000 nm); 2.2.2 Nd:YAG-Lasers (1064 nm); 2.2.3 Fiber Lasers; 2.2.4 CO2-Lasers (10.6 m); 2.2.5 Summary; 2.3 Beam Guiding and Focusing
2.3.1 Beam-Guiding Systems2.3.1.1 Glass-Fiber Systems; 2.3.1.2 Mirror Systems; 2.3.2 Focusing Systems; 2.3.2.1 Static Focusing Systems; 2.3.2.2 Dynamic Focusing Systems; 2.3.3 Beam-Shaping Optics; 2.4 Principle Setup of Laser Welding Systems; References; 3 Basics of Laser Plastic Welding; 3.1 Heat Generation and Dissipation; 3.1.1 Absorption of Laser Radiation; 3.1.1.1 Direct Absorption; 3.1.1.2 Indirect Absorption; 3.1.1.3 Hindered Absorption by Internal Scattering; 3.1.2 Transfer of Laser Energy into Process Heat; 3.1.3 Dissipation of Process Heat
3.1.4 Process Simulation by Complex Computation3.2 Theory of Fusion Process; 3.2.1 Interdiffusion Process (Reptation Model); 3.2.2 Interchange of Macromolecules by Squeeze Flow Process; 3.2.3 Mixing of Crystalline Phases; 3.3 Material Compatibility; References; 4 Process of Laser Plastic Welding; 4.1 Basic Process Principles; 4.1.1 Butt-Joint Welding; 4.1.2 Through-Transmission Welding; 4.2 Process Types; 4.2.1 Contour Welding; 4.2.2 Quasisimultaneous Welding; 4.2.3 Simultaneous Welding; 4.2.4 Special Processes; 4.2.4.1 Mask Laser Welding; 4.2.4.2 TWIST Laser Welding
4.2.4.3 Globo Laser Welding

Sommario/riassunto

This is the first detailed description in English of radiation and polymeric material interaction and the influences of thermal and optical material properties. As such, it provides comprehensive information on material and process characteristics as well as applications regarding plastic laser welding. The first part of this practical book introduces the structure and physical properties of plastics, before discussing the interaction of material and radiation in the NIR and IR spectral range. This is followed by an overview of the physical foundations of laser radiation and laser sources