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Novel Laser Welding Technique for Transparent Polymer Material Using Photochromic-dye

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This paper deals with a new laser transmitting welding (LTW) technique that enables to weld transparent polymer materials. Key of this technique is use of photochromic-dye to actively and locally control the radiation absorption coefficient of a transparent polymer material. In the experiment, photochromic-dye was pre-mixed with polystyrene using organic solvent. He-Cd laser and Ar ion laser were used as excitation and heating energy source, respectively. Infrared thermo-camera was used to measure the sample surface temperature. As a result, successful temperature increase of 60-70 deg.C was realized at the heating point which radiation absorption coefficient was locally increased by the He-Cd laser excitation. Trial welding of the polystyrene sample was successfully realized by applying the present technique.