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LUIS FELIPE DEVIA: Ultrafast laser welding of ceramics.

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Material welding techniques have been a key aspect in the last industrial era. In fact, still there are some welding challenging applications that involve ceramic characteristics i. e. joining pieces of components in which biocompatibility or extremely high temperatures are in play. High temperature resistance of ceramics makes its welding a complex and difficult process.
The present work describes an ultrafast pulsed laser welding approach that relies on focusing light on the interfaces to ensure an appropriate optical interaction volume in the ceramic pieces to stimulate nonlinear absorption processes, causing localized melting rather than ablation.
The methodology of this work considered the optical properties of the polycrystalline ceramics: linear and nonlinear absorption, and the laser parameters: exposure time, number of laser pulses, and pulse duration (femtosecond versus picosecond). The interplay between linear and nonlinear optical properties and laser energy–material coupling was studied. The resulting laser welding enable the ceramic pieces as integral components within devices for harsh environments as well as in optoelectronic and/or electronic packages needing visible-radio frequency transparency.

Session Classification: PLENARY TALKS

Track Classification: SYMPOSIUM ON LASER ABLATION