

Internship, Research Labworks, or Master Thesis

on

Ultrashort pulse induced bonding of dissimilar materials

Femtosecond laser micromachining permits the fabrication of outstanding photonic devices using the three dimensional writing ability [1,2]. Depending on the laser parameters various modifications within the bulk of glass can be induced. At high repetition rates the laser pulses act as local heat source allowing for the local melting of glass that can be used for bonding with high stability [3].

Within this project, the bonding of dissimilar materials shall be investigated. Recent results reveal the successful bonding of glass-semiconductor as well as glass-metal interfaces with high breaking strength. However, quantitative studies are necessary to determine optimal laser and processing parameters. Besides the breaking strength of welded samples also defect generation and the induced stress shall be analyzed. Subsequently, these results may be transferred for selective applications such as housing of electronic components.

Covered subjects

- Laser materials processing
- Femtosecond phenomena
- Ultrafast lasers

Contact for further information and application

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[1] K. Itoh, W. Watanabe, S. Nolte, C. B. Schaffer, „Ultrafast processes for bulk modification of transparent materials”, MRS Bulletin 31, 620 – 625 (2006).

[2] R. R. Gattass and E. Mazur, “Femtosecond laser micromachining in transparent materials”, Nat. Phot. 2, 219-225 (2008).

[3] S. Richter, F. Zimmermann, A. Tünnermann, Stefan Nolte, „Laser welding of glasses at high repetition rates fundamentals and prospects”, Optics & Laser Technology, 83, 59–66 (2016).