

Liquid Interlayer Assisted Femtosecond Laser Welding of Non-Optical Contact Glasses

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Femtosecond laser welding has emerged as a significant technology for joining transparent materials, and welding of glass materials has been extensively researched for in recent years [1, 2]. However, achieving a robust connection requires optical contact between two glass substrates during laser processing, which complicates the welding process and increases costs. To achieve high-strength welding of glass samples without optical contact, the substrates are tightly pressed against each other to minimize the gap, allowing the layers melted by the laser irradiation to completely fill the gap. The tight pressing results in generation of stress in the welded sample. To overcome these issues, we present femtosecond laser welding of non-optical contact glasses with the assistance of water/silver ion solution interlayer. The welding quality is examined and compared with other methods, showing that the glasses welded by our method has high uniformity with high bonding strength (>18.3 MPa). The principle behind achieving high-quality welding is also discussed to elucidate the superiority of this method.

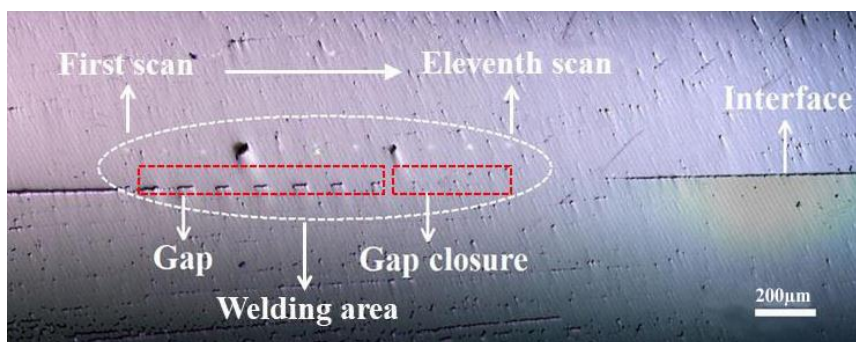


Figure. Cross-sectional view of glasses welded by multi-scanning the focused femtosecond laser beam assisted with liquid interlayer. With increasing the number of scans, the sample gap is completely sealed.

References:

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- [2] K. Cvecek, S. Dehmel, I. Miyamoto, M. Schmidt. A review on glass welding by ultra-short laser pulses, *Int. J. Extrem. Manuf.* 1(2019), 042001.