Micro-explosions Induced by Infrared Femtosecond Laser Inside Silicon

MD JANIBUL ALAM SOEB

LP3- Lasers, Plasmas and Photonic Processes, Marseille, France

It was previously shown that tight focusing with a maximum numerical aperture of 1.5 was not able to overcome the plasma effects and strong nonlinear effects before the focus. But in this thesis, we have established that solid-immersion focusing can be the remedy for this limitation. By applying this technique we can obtain hyper numerical aperture which would be more than 3 in our case. By using this extreme numerical aperture and ultra-intense laser pulses, it is possible to create superdense phase inside bulk of silicon which was one of our main concerns. Our finding also showed that it is possible to write 3D monolithic directly which will be an attractive tool for silicon photonics. For that investigation, we have demonstrated micro-explosions at a depth of 285um inside bulk of silicon with femtosecond laser pulses.