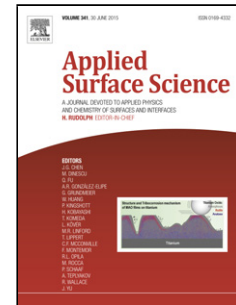


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Fabrication of two-dimensional periodic structures on silicon after scanning irradiation with femtosecond laser multi-beams

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Abstract: Two-dimensional (2D) periodic structures were fabricated on silicon surfaces by femtosecond laser irradiation in air and water, with the assistance of a microlens array (MLA) placed in the beam's path. By scanning the laser beam along the silicon surface, multiple grooves were simultaneously fabricated in parallel along with smaller laser-induced ripples. The 2D periodic structures contained long-periodic grooves and perpendicular short-periodic laser-induced ripples, which had periods of several microns and several hundred nanometers, respectively. We investigated the influence of laser power and scanning velocity on the morphological evolution of the 2D periodic structures in air and water. Large-area grid-like structures with ripples were fabricated by successively scanning once along each direction of the silicon's surface, which showed enhanced optical absorption. Hydrofluoric acid was then used to remove any oxygen and laser-induced defects for all-silicon structures.

Keywords: Femtosecond laser; silicon; periodic structures; combined structures.

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