

Abstract Submitted
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Single pulse excimer laser fabrication of nano-sharp conical silicon arrays: computer modeling for optimal experimental parameters.¹ JULIA EIZENKOP, IVAN AVRUTSKY, Wayne State University, DANIEL GEORGIEV, University of Toledo, VIPIN CHAUDHARY, New York State University — We present computer simulation and experiment on the formation of sharp conical tips on single-crystal silicon thin films, silicon-on-insulator (SOI), subjected to irradiation by a single 25ns pulse from a KrF excimer laser, focused onto a spot several micrometers in diameter. These structures have heights of about 1 μm and apical radii of curvature of several tens of nanometers. Besides technological applications like probes for scanning probe microscopy techniques and emitters for field-emission-based devices, new methods for fabrication of such structures are of interest to a number of novel biomedical design schemes. These include regulation of the attachment, growth and morphology of neural cells, and implanted electrode arrays for neural communication experiments and sensing. This new laser-based technique is simple, offers very good reproducibility, and is a potentially low-cost technological solution for the fabrication of such structures. Our computer simulation includes two-dimensional time-dependant heat transfer and phase transformations in Si films on SiO_2 substrates that result from the laser irradiation and serves to determine best conditions to produce conical tips.

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