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Laser Phase Separation of Si Rich Oxides: The Role of Composition EMEL SUNGUR OZEN, ATILLA AYDINLI, SINAN GUNDOGDU, Bilkent University, Department of Physics, Ankara, 06800 — Continuous-wave laser annealing of Si-rich oxide thin films with varying Si content were performed in order to obtain Si nanocrystals (Si_{nc}) embedded in silica. The composition, irradiation times and power densities were investigated as well as the role of hydrogen in phase separation. Si_{nc} in SiO_2 appear to be very promising for the realization of optical function as light emission or optical memory. Nanocrystaline Si finds also important utility in photovoltaics thanks to quantum confinement in the nanostructures offering a wider bandgap material which, in a tandem configuration, can allow a better use of the solar spectrum. Conventional techniques utilize high-temperature processing to obtain Si-SiO_2 phase separation. These processes are not compatible with mass production methods. An alternative approach capable of avoiding high temperature processing is the laser annealing of SiO_x films. The structural effect due to annealing were investigated by Raman and photoluminescence spectroscopy. It has been shown that the size and amount of Si_{nc} depends both on the oxygen content and on the laser power density. PECVD grown hydrogenated SiO_x films were compared with sputtered films without hydrogen to identify its role for the phase separation.

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