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Deposition and Characterization of Er-doped Si Thin Films Fabricated by Laser Ablation

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We have fabricated Er-doped Si thin films with ~ 40 nm thickness by pulsed laser deposition. Si:Er₂O₃ target was irradiated by a focused Nd:YAG laser pulse. The sharp intense photoluminescence(PL) peak at 1.54 μm from Er-doped Si thin films was observed at room temperature. The Er³⁺ PL efficiency was remarkably improved by annealing at 500°C in He atmosphere. We have characterized Er-doped Si thin films by SEM, XPS, SIMS, and RBS. Er⁺, Er²⁺, Si⁺, and O⁺ ions were detected in the plume by quadrupole mass spectrometer and their kinetic energies were obtained by time-of-flight method. Optical emissions from atomic species like Er⁺, Er, Si⁺, and Si were observed but there were no molecular emissions from the plume.