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

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 \(\mu\)m from Er-doped Si thin films was observed at room temperature. The Er\(^{3+}\) 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\(^{+}\), Er\(^{2+}\), 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.