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Microprobe X-ray Absorption Spectroscopy of Chalcogen Doped Silicon BONNA NEWMAN, JOE SULLIVAN, Massachusetts Institute of Technology, MARK WINKLER, MENG-JU SHER, Harvard University, MATTHEW MARCUS, Advanced Light Source, Lawrence Berkeley National Lab, MATTHEW SMITH, SILVIJA GRADECAK, Massachusetts Institute of Technology, ERIC MAZUR, Harvard University, TONIO BUONASSISI, Massachusetts Institute of Technology — Doping Si with chalcogen atoms (S, Se, and Te) in excess of the solubility limit has been shown to result in optical absorption below the bandgap. This material, known as "black silicon", is promising for infrared photon detectors and possibly photovoltaic devices. We report on the relationship between the chemical state of the dopant atoms and infrared absorption properties. A high concentration of 10^{20} dopant atoms/cm^3 in the near-surface layer allows for extended X-ray absorption fine structure (EXAFS) investigations and determination of chemical state. We combine these results with absorption measurements and Auger spectroscopy to understand the correlations between optical and structural properties of chalcogen doped Si.

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