Surface damage of SmB$_6$ through ion-irradiation NICHOLAS WAKEHAM, YONGQIANG WANG, Los Alamos National Laboratory, ZACHARY FISK, University of California, Irvine, FILIP RONNING, JOE THOMPSON, Los Alamos National Laboratory — SmB$_6$ is a Kondo insulator, but there is strong evidence for an intrinsic conductive surface state at low temperatures. Theoretical work indicates that SmB$_6$ may be a topological Kondo insulator with a topologically protected surface state that is robust against time-reversal invariant perturbations.

To investigate this robustness, we have used non-magnetic ion-irradiation to damage the (001) surfaces of SmB$_6$ single crystals to varying depths, and have measured the resistivity as a function of temperature for each depth of damage. We observe a reduction in the residual resistivity with increasing depth of damage. Our data are consistent with a model in which the surface state is not destroyed by the ion-irradiation, but instead the damaged layer is poorly conducting and the initial surface state is reconstructed below the damage. This behavior is consistent with a surface state that is topologically protected. Investigations of time-reversal symmetry breaking perturbations of the surface layer, with magnetic ion-irradiation, will also be discussed.