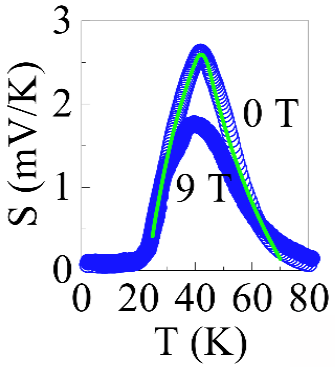
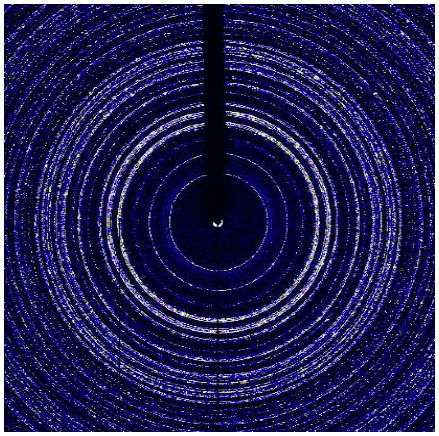
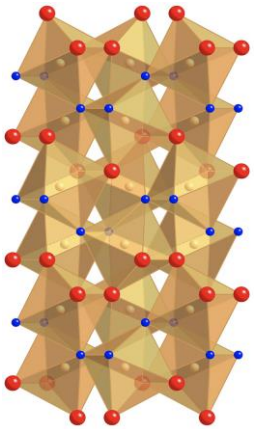
More Thermopower Than Expected



(Top) Thermopower of the material as a function of temperature at 9 Tesla and 0 Tesla field. (Bottom) the crystal structure of CoSbS (right) determined from Debye-Scherrer x-ray diffraction rings (left).





H. Yang, Q. Du, M. Abeykoon, Y. Liu, G. Kotliar, C. Petrovic. *Phys. Rev. Lett.* 123, 076602 (2019).

Work was performed in part at Brookhaven National Laboratory

Scientific Achievement

Scientists revealed the high electronic thermopower of a transition metal made of cobalt (Co), antimony (Sb) and sulfur (S) at cryogenic temperatures. CoSbS already shows high thermoelectric performance at temperatures high above room temperature.

Significance and Impact

By using thermoelectric materials, excess heat can be transformed into electricity; however, most thermoelectric materials are not as efficient below room temperature. CoSbS is promising for designing new thermoelectric materials for applications at cryogenic temperatures.

Research Details

- The scientists studied the temperature evolution of the atomic structure of CoSbS using x-ray powder diffraction at NSLS-II's PDF (28-ID-1) beamline.
- Giant diffusion thermopower in CoSbS is related to electronic structure and impurity states.
- The study shows that the electron diffusion within the valence band of the material is responsible for this property.