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Pressure tuning the lattice and optical response of Ag_2S ZHAO ZHAO, Department of Physics, Stanford University, HUA WEI, Department of Materials Science and Engineering, University of Tennessee, WENDY MAO, Photon Science, SLAC; Department of Geological Sciences, Stanford University — Silver chalcogenides Ag_2E (E = S, Se, and Te) is a group of materials attracting intense scientific and industrial interest recently. The ability to tune their crystal structure and electronic structure away from their pristine states opens up new optics and opto-electronics applications. In this work, we systematically studied the high pressure structural and optical behavior of Ag_2S by in-situ angle dispersive X-ray Diffraction (XRD) and Infrared (IR) measurements in a diamond anvil cell. Though a series of structural transitions and lattice contractions, the structural symmetrization of Ag_2S is seen from the decrease of $\beta$from 99^{o}to 90^o. The IR transmission and reflection measurements showed that pressure continuously tuned semiconducting Ag_2S to metallic at around 22 GPa. By Drude model analysis of the IR reflectivity, the optical conductivity shows radical evolution. In particularly, the highest DC conductivity reaches 100 Ω^{-1}cm^{-1} at 40 GPa . Our results highlight pressure's dramatic role in tuning the lattice and electronic state of silver chalcogenides.

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