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Metallic insulator transition in K-doped $BaMn_2As_2$: Magnetic, optical, and transport properties of $BaMn_2As_2$ and $Ba_{1-x}K_xMn_2As_2$ SHELBY ZELLMAN, DANIEL MCNALLY, Stony Brook University, KANGBO HAO, KIRK POST, DIMITRI BASOV, University of California, San Diego, CHRISTOPHER HOMES, Brookhaven National Laboratory, MEIGAN ARONSON, Stony Brook University, Brookhaven National Laboratory, CORRELATED ELECTRONS GROUP TEAM, INFRARED SPECTROSCOPY OF NOVEL ELECTRONIC AND MAGNETIC MATERIALS COLLABORATION, ELECTRON SPECTROSCOPY GROUP COLLABORATION — Square-net Mn- pnictides are strongly correlated antiferromagnetic (AF) insulators that can potentially be transformed into metals using pressure or charge doping. $BaMn_2As_2$ becomes an AF metal when 5% of K is substituted on the Ba site, and we present here an optical study of this insulator-metal transition. Our measurements confirmed that the resistivity r(T) of undoped $BaMn_2As_2$ is insulating, but becomes metallic with as little as 5%K doping. We measured optical transmission in the visible region of $BaMn_2As_2$, finding a direct charge gap of ~ 5500 cm^{-1}, much larger than previously reported, or the activation gaps determined from r(T). Reflectance measurements were performed to determine if a Drude peak forms at the lowest energies in the doped samples. These measurements underscore the importance of electron correlations in $BaMn_2As_2$ as it approaches metallization. We acknowledge the Office of the Assistant Secretary of Defense for Research and Engineering for providing the NSSEFF funds that supported this research and the DOE under contract No. DE-AC02-98CH10886.

Shelby Zellman
Stony Brook University

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