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Small Polaron Conduction in Glasses: Established Physics and New Data MARK HENDERSON, BIPRODAS DUTTA, IAN PEGG, The Catholic University of America — Electronic and optical phenomena in crystals and glasses can be usefully analyzed in the band-structure framework, which determines the ways electrons are allowed to behave inside these materials. Especially interesting is the wide array of phenomena that can be observed in glasses. Disorder in glasses leads to high rates of electron scattering, large band-gaps, and, for strong enough atomic interactions, the localization of electrons. Modes of conduction, such as site hopping, still exist for these trapped electrons; resistivity can be greatly changed depending on the environment created by the inclusion of various ions. In this presentation, I will begin with the band-structure model for crystals and then glasses. I will discuss the ways electrons propagate in these materials and how optical processes depend on the allowed energy states of those electrons. I will also explain how the mixing of different ions in glasses leads to striking changes in their properties. Finally, I will present hot off the alumina substrate data indicating the curious existence of trapped electron hopping in bismuth containing borosilicate glasses.

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