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Positively Charged Muonium Diffusion in In_2O_3[1] BRITTANY BAKER, Francis Marion University, ROGER LICHTI, Texas Tech University, PATRICK MENGYAN, Northern Michigan University, GURKAN CELEBI, Istanbul University — Indium oxide (In_2O_3) is a transparent conducting oxide (TCO) commonly found in mixtures used as windows and transparent electrodes in optical semiconductor devices (i.e. LEDs and solar cells). Hydrogen diffusion in the TCO layer and across the interface between the TCO and the semiconductor device plays an important role in the degradation of the transparency of TCO windows or electrodes. Theoretical calculations show positive H as the only stable, interstitial H charge state above the neutral H ionization temperature. Muon Spin Relaxation measurements were performed to investigate positive muonium (Mu^+) diffusion which are an experimentally accessible analog to H^+. Three distinct Mu^+ states are identified between 2 K and 1000 K; a static low temperature state, a dynamic state above room temperature, and a trapping state from 400 K to 800 K. The trap component creates complex dynamics and has been modeled assuming the Mu^+ transfers between the dynamic state and the trapping state. Fits of the model to the data provide information about capture and release rates and energy barriers into and out of the trap state. Here we present and discuss results from these fits, possible site locations for each state and likely diffusion paths.

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