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Analysis of Positively Charged Muonium in Tin Oxide

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Tin oxide is a transparent conducting oxide (TCO) that has many applications in optoelectronic devices, such as solar cells and LED's. Tin oxide is naturally n-type with hydrogen acting as a shallow donor. MuSR zero-field measurements were taken on a single crystal sample from 2 K to 710 K in a closed cycle refrigerator and from 300 K to 1080 K in an optical furnace. The zero-field measurements allow for analysis of positively charged muonium defects in samples. The analysis of the results shows two positive muonium states with hints of an additional state at temperatures below 300 K. The current model shows a high occupancy positive muonium state and a low occupancy positive muonium state with a slow migration of muonium from the high occupancy state to the low occupancy state above 300 K. We will present details of an updated model and the muonium sites, energies barriers, and diffusion processes of the positively charged muonium determined from the model.

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