Measurement of muonium reactions with laser-pumped molecules

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We have recently performed the first measurements of muonium reactions with laser-pumped molecules [1]. These studies are unique to pulsed muon facilities and extend muonium chemistry to the realm of excited states and facilitate the detection of muoniated molecules by their spin evolution after laser excitation. In this presentation, we first review our recent “proof of concept” results and then present new data from reactions of muonium with singlet oxygen produced by photosensitization of Rose Bengal as well as reactions with Rose Bengal and Crystal Violet. These types of investigations will lead to new opportunities to study the kinetic isotope effects (KIEs) of Mu/H reactions and to probe radiolysis processes involved in muonium formation, as well as muoniated intermediates in excited states. Insights on future applications of laser-pumped muonium chemistry at pulsed muon facilities will be presented.