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Progress on Rotational Cooling of SiO+[1] YEN-WEI LIN, PATRICK STOLLENWERK, BRIAN ODOM, Northwestern University — Producing ultracold molecules is the first step in precision molecular spectroscopy. Here we present some of the challenges and advantages of SiO+ as well as some of our progress toward meeting those challenges. To demonstrate ground state SiO+, we first load about 100 SiO+ via 2+1 REMPI into an ion trap. Translational motion of SiO+ is then sympathetically cooled by co-trapped Ba+, which is laser cooled. To prepare the population into the ground state, we optically pump the P-branch (rotational cooling transitions) in the B:Σ(v'=0) $\leftarrow$ X:Σ(v=0) band with broadband radiation. Because the band is highly diagonal, population can be effectively driven into the rotational ground state before falling into other manifolds. The broadband source, a fs laser, is spectrally filtered using an ultrashort pulse shaping technique to drive only the P-branch. Attention must be paid when aligning the optics to obtain sufficient masking resolution. We have achieved 3 cm^{-1} resolution, which is sufficient to modify a broadband source for rotationally cooling SiO+.

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