

Abstract for an Invited Paper
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Optical production of ultracold polar molecules¹

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We have recently demonstrated the production of ultracold polar RbCs molecules in their absolute vibronic ground state, via photoassociation of laser-cooled atoms followed by a laser-stimulated state transfer process [J. Sage *et al.*, Phys. Rev. Lett. **94**, 203001 (2005)]. The resulting sample of $X^1\Sigma^+(v = 0)$ molecules has a translational temperature of $\sim 100 \mu\text{K}$ and a narrow distribution of rotational states. With the method described here it should be possible to produce samples even colder in all degrees of freedom, as well as other alkali species. Work is ongoing to separate and trap these ground-state molecules. Applications for such a trapped sample will be discussed.

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