PROGRESS TOWARDS FORMATION AND SPECTROSCOPY OF ULTRACOLD GROUND-STATE $^{85}Rb_2$ MOLECULES IN AN OPTICAL TRAP

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We have very recently completed construction of an apparatus designed to efficiently produce ultracold Rb_2 molecules in a quasi-electrostatic optical trap (QUEST) by photoassociation (PA). The QUEST is loaded from a magneto-optical trap (MOT), with additional cooling and compression stages to optimize the density and temperature. The trapped atom cloud is detected by absorption imaging. Molecules will be formed from the optically trapped atoms by PA into levels bound by $\simeq 1 - 100$ cm^{-1}, followed by radiative decay. Employing the QUEST will allow optical trapping of Rb_2 in the singlet $X\,^1\Sigma_g^+$ state, as well as enhancing greatly the PA rates relative to previous work in an ordinary MOT.[a] We will describe in detail our progress in forming and detecting ultracold molecules in the dipole trap. We will also describe progress on experiments using state-selective detection to investigate collisions involving the trapped molecules. This work is supported by the National Science Foundation.

[a] Y. Huang, J. Qi, H. K. Pechkis, D. Wang, E. E. Eyler, P. L. Gould, and W. C. Stwalley, J. Phys. B **39**, S857 (2006).