Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Controlled Formation of Ultracold Diatoms via Laser Catalysis: ^{6}Li^{6}Li+^{7}Li[1] XUAN LI, GREGORY PARKER, Homer L. Dodge Department of Physics and Astronomy, University of Oklahoma, PAUL BRUMER, Department of Chemistry and Center for Quantum Information and Quantum Control, University of Toronto, Canada, IOANNIS THANOPULOS, MOSHE SHAPIRO, Department of Chemistry, The University of British Columbia, Vancouver, Canada — Laser catalysis techniques are applied to the quantum control of an ultracold ^{6}Li^{6}Li^{7}Li collinear collision on the $1^4A'$ electronic potential energy surface via a fermion-boson light-induced exchange reaction, $^7\mathrm{Li}^6\mathrm{Li}(^3\Sigma^+)+^6\mathrm{Li}(^2S) \overset{\hbar\omega_0}{\longleftrightarrow} (^7\mathrm{Li}^6\mathrm{Li}^6\mathrm{Li})^* \overset{\hbar\omega_0}{\longleftrightarrow} {}^6\mathrm{Li}_2(^3\Sigma_u^+)$ $+^7\mathrm{Li}(^2S)$. We show that the cold ($T_r \approx 1.75$ K) reactant ^{6}Li+^{6}Li^{7}Li, when optically coupled to the intermediate bound states on the $1^4A''$ electronic potential energy surface, can be transferred to the ultracold (0.01 mK $< T_p <$ 1 mK) product arrangement, ^{7}Li+^{6}Li^{6}Li, with an extraordinary reaction yield of up to 100% with a laser intensity of $I = 0.1\mathrm{kW/cm}^2 \sim 10\ \mathrm{MW/cm}^2$. Here, T_r and T_p denote the temperatures in the reactant arrangement and the product arrangement respectively. We propose this scheme as an experimental method to effectively produce ultracold dimers.

[1]NSF PHY-0701445, PHY-0355057

Xuan Li
Homer L. Dodge Dept of Physics and Astronomy, University of Oklahoma

Date submitted: 14 Feb 2008 Electronic form version 1.4