COLD MOLECULES AND SPECTROSCOPY: A CHALLENGE AND NEW CHANCES

E. TIEMANN, H. KNÖCKEL, and C. LISDAT, *Institut für Quantenoptik, Leibniz Universität Hannover, Welfengarten 1, 30167 Hannover, Germany*; A. PASHOV, *Department of Physics, Sofia University, 5 James Bourchier boulevard, 1164 Sofia, Bulgaria*; M. TAMANIS, R. FERBER, *Department of Physics and Institute of Atomic Physics and Spectroscopy, University of Latvia, 19 Rainis boulevard, Riga LV-1586, Latvia*.

The fast advance in the field of ultracold ensembles is very much the result of the detailed knowledge of spectroscopic data on atoms and molecules obtained during earlier decades. With examples on diatomic alkalis and alkaline earth species we will show the new demands on high precision spectroscopy and the evaluation of the data to allow reliable predictions of the behavior of ultracold atomic and molecular ensembles. Recent progress on the combined analysis of huge sets of data from Fourier transform spectroscopy, high resolution beam spectroscopy and Feshbach spectroscopy will be reported, which indicates that we reach the limit of applying mass scaling for the prediction of ultracold collisions of different isotopic species.

Cold chemistry, i.e. chemistry at threshold with large effects by possible resonance phenomena, is a new field which needs highly reliable spectroscopic data for predictions and convincing interpretations of observations. We will use the example of SO_2 to describe the possibilities of studies of photodissociation by tuning the dissociation channels with Stark fields. Slow SO_2 is produced by Stark deceleration using a decelerator chain with 326 stages for the heavy molecule SO_2[a] and cold fragments SO and O, trappable by their electric or magnetic dipole moment, will be obtained.

[a] O. Bucicov, M. Nowak, S. Jung, G. Meijer, E. Tiemann, and Ch. Lisdat, Eur. Phys. J. D DOI: 10.1140/epjd/e2008-00001-y