MOLECULAR ROTATION IN QUANTUM LIQUIDS

B. SARTAKOV, *General Physics Institute RAS, Vavilov str. 38, 119991 Moscow, Russia*; A. VILESOV, *Department of Chemistry, University of Southern California, Los Angeles, CA 90089, USA*; and J. PETER TOENNIES, *Max-Planck-Institut fur Stromungsforschung, Bunsenstrasse 10 37073 Goettingen, Germany*.

Rotationally resolved IR spectra of molecules and hydrogen clusters trapped in $^4$He and mixed $^3$He/$^4$He droplets are presented. The newest analysis of spectra in terms of effective rotational constants of OCS-$(pH_2)_n$ and OCS-$(oD_2)_n$ complexes with n=11,...16 is presented. Whereas molecular rotation in $^4$He can be modelled by a free rotor with effective rotational constants the effect of interaction between a molecule and its $H_2$ solvation shell is more pronounced. Analysis of the spectra within the frameworks of a rigid symmetric $H_2$ shell proves the inconsistency of the rigid shell model with the experimental observations. Furthermore it suggests existence of some low energy excitations (E$\sim$0.1 cm$^{-1}$) which are tentatively assigned to tunnelling states of the $H_2$ cluster.