MATRIX ISOLATION SPECTROSCOPY OF ATOMIC, MOLECULAR, AND IONIC LASER ABLATED SPECIES IN SOLID HYDROGENIC MATRICES

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For several years, we have been pursuing the trapping of atomic radicals in solid molecular hydrogenic matrices at T = 2 K [a]. We have made extensive use of laser ablation of solid targets as a source of atomic species for trapping in these matrices. The full-time incorporation of an FTIR absorption diagnostic into our apparatus has resulted in the observation of various trapped molecular species formed either in the ablation process, by recombination during deposition, or by reactions with the hydrogenic matrix hosts. We have also recently learned how to deposit millimeters thick 99.99para-hydrogen matrices in less than an hour. Under certain ablation conditions these thick matrices exhibit novel charge-induced absorptions of the hydrogens caused by trapped ionic species, in analogy to the well known absorptions of irradiated solid hydrogens [b]. We conclude that the solid molecular hydrogens are eminently suitable as matrix hosts, with the impurity-induced hydrogen transitions providing a new spectroscopic aspect unavailable with rare gas hosts.

[a] M.E. Fajardo, S. Tam, T.L. Thompson, M.E. Cordonnier, Chem. Phys. 189, 351 (1994).
[b] T Momose, K.E. Kerr, D.P. Weliky, C.M. Gabrys, R.M. Dickson, and T. Oka, J. Chem. Phys. 100, 7840 (1994).