NOVEL RARE GAS CHEMISTRY

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UV-Photolysis of rare gas matrices doped with hydrogen halides yield H and Y (Y=halogen) atoms, and further excitation of the charge-transfer transition of XY pairs (X=Ar, Kr, Xe) results in mobilised holes. Permanent trapping of the holes may occur for instance in centers of type $(XHX)^+$. Annealing of the UV-irradiated H-containing matrices results in extremely strong IR-absorptions, which could by doping experiments be shown to belong to neutral species of type HXY. The novel rare-gas containing species found so far are HXeCl, HXeBr, HXeI, HKrCl and HXeH. All these species are strongly polar and their common structure is $(HX)^+Y^-$. In order to learn more about the potential surface, detailed spectroscopic studies are performed on HXeI. This species can be photodecomposed into neutral atoms by infrared irradiation in the 3 μm region, and recovered quantitatively thermally at temperatures below 30 K. An Arrhenius analysis propose for the barrier from neutral atoms to HXeI a value of 700 cm^{-1}. We suggest that this barrier originates from an avoided crossing between two singlet surfaces limiting either to separated atoms H + Xe + I or to ionic species $(HXe)^+ + I^-$.

References:

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