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Spectroscopy of free radicals and radical containing entrance-channel complexes in superfluid helium nanodroplets JEREMY MERRITT, Department of Chemistry, University of North Carolina - Chapel Hill, JOCHEN KÜPPER, Fritz-Haber-Institut der MPG, Faradayweg 4-6, 14195 Berlin, Germany, ROGER MILLER, Department of Chemistry, University of North Carolina - Chapel Hill — The unique properties of superfluid helium nanodroplets, namely their low temperature (0.4 K) and fast cooling rates (10^{16} Ks^{-1}), provide novel opportunities for the formation and high-resolution study of metastable structures or molecular complexes containing free radicals. We discuss methods for the production of radicals and their applicability for embedding the radicals in helium nanodroplets. The spectroscopy of free radicals (i.e. C_3H_3) and of radical containing entrance-channel complexes, for example X–HY (X=Cl, Br, I, CH_3; Y=F, CN), embedded in helium nanodroplets is detailed. The observed complexes provide new information on the potential energy surfaces of several fundamental chemical reactions and on the intermolecular interactions present in open-shell systems. Prospects for further experiments of radicals embedded in helium droplets are discussed.

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