THE PURE ROTATIONAL SPECTRA AND HYPERFINE STRUCTURES OF SCANDIUM MONOHALIDES

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The pure rotational spectra of ScF, ScCl and ScBr have been recorded using Fourier transform microwave spectroscopy in the frequency range 6-26 GHz. The molecules were generated by laser ablation of a solid Sc rod in the presence of a low percentage of SF_6, Cl_2 or Br_2, respectively, in argon. They are the first measurements of the pure rotational spectra of the $X^1\Sigma^+$ states for all three molecules. For ScF, only the J=1-0 rotational transition could be observed in the frequency range of our spectrometer. The electric quadruploe coupling constant and the spin-rotation constant for Sc have been determined. For ScCl, the two lowest rotational transitions were measured. The electric quadrupole constants and the spin-rotation constants of Sc and both isotopes of Cl have been determined. For ScBr, for which there had previously been no rotational spectrum of any kind, transitions of both Br isotopes have been measured. The rotational constants have been used to evaluate its geometry. The hyperfine parameters for the three molecules are interpreted in terms of the electronic structure and chemical bonding. Comparsions will made to similar molecules.