A "WET DOG" TUNNELING MOTION AS THE CAUSE FOR THE DOUBLED ROTATIONAL SPECTRUM OF 1-IODONONAFLUOROBUTANE

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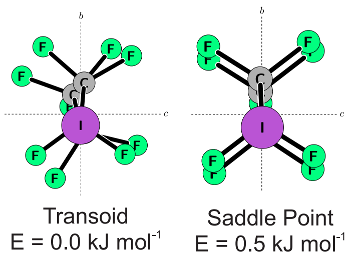

A chirped pulse Fourier transform microwave spectrometer has been used to record the rotational spectra of 1-iodononafluorobutane between 8 GHz and 12 GHz. The target compound was spectroscopically examined as it participated in a supersonic expansion of argon. The spectra recorded are dense owing in part to the small rotational constants, $B + C \approx$ 480 MHz, but also to hyperfine structure generated by the coupling of angular momenta of the iodine nucleus and the rotating molecular frame, e.g. $\mid \chi_{ab} \mid \approx$ 1200 MHz. Notably all of the hyperfine components were observed as doublets. It is postulated that this doubling effect is the result of a low barrier, double minimum potential between two mirror image transoid structures. The tunneling motion between these structures resembles that of a "wet dog" shaking itself dry. Numerous transitions are shifted in frequency and it is proposed that the density of rotational energy levels from the two interacting states results in numerous perturbations to the energy levels involved. A preliminary spectral analysis of over 400 transitions will be presented, along with the results of supporting quantum mechanical calculations.