

Emission Spectra and Chemical Reactions of Fluorine-Substituted Benzene in a High Frequency Discharge

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An investigation has been carried out to study the emission spectra of radiofrequency glow discharges through vapors of  $C_6H_5F$ , 1,2-, 1,3-, 1,4- $C_6H_4F_2$ ,  $C_6HF_5$  and  $C_6F_6$  and to characterize the reaction products. Under mild discharge conditions it has been observed that molecules with a low degree of fluorine substitution on the benzene ring gives a molecular emission corresponding to a  $\pi - \pi^*$  electronic transition but when the power applied to the discharge was increased an enhancement of the emission bands due to species produced by fragmentation of the molecules was increased. Even under the mildest condition necessary to sustain the plasma, only emission bands due to  $CF_2$  radicals were detected for the penta- and hexafluorobenzene. Reaction products formed mainly of polymeric materials, were analyzed by gas chromatography, infrared spectrophotometry and mass spectrometry. Molecular weight distribution studies of soluble polymeric materials indicate that the degree of polymerization increases with the degree of fluorine substitution on the benzene ring. Some interesting relationships were made between our results and fluorescence and triplet yields measurements reported by other authors on these molecules.

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