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NUCLEAR MAGNETIC RESONANCE STUDY of FLUORINE-GRAPHITE INTERCALATION COMPOUNDS

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To study the origin of semimetal-metal and metal-insulator transformations, localization effects and C-F bonding in fluorine-intercalated graphite C_xF, ^{13}C and ^{19}F NMR investigations have been carried out for a wide range of fluorine content, $3.8 < x < 12.7$. Fluorine spectra for small fluorine content, $x > 8$, are attributed to mobile fluorine acceptor species which are responsible for the increase of electric conductivity in the dilute compound. When increasing the fluorine content to $x \sim 8$ corresponding to the maximum electric conductivity, covalent C-F bonds start to occur. The number of these bonds grows with fluorine content resulting in the decrease in conductivity which is caused by a percolation mechanism rather than by a change in bond length. A difference in ^{19}F chemical shift for fluorine-intercalated graphite C_xF and covalent graphite fluoride $(CF)_n$ has been observed and is attributed to different C-F bonding in these compounds.