I-1

MAGNETIC RESONANCE OF FLUORINE-CONTAINING INTERCALATION COMPOUNDS OF GRAPHITE

Lawrence B. Ebert

Corporate Research-Science Labs, Exxon Research and Engineering Company, Linden, NJ 07036 (U.S.A.)

Graphite will react with both reductants and oxidants to form intercalation compounds which are chemically analogous to ions of aromatic molecules. Specifically, many fluorine-containing molecules will oxidize graphite to make new compounds, and fluorine nuclear magnetic resonance has proved useful in characterizing such products with respect to oxidation state and mobility of the inserted species. Non-oxidizing fluorides (as BF_3 or PF_5) can be introduced into graphite only with an oxidant (as ClF) to yield highly mobile anions and/or anion-neutral mixtures within the graphite planes. The weakly oxidizing fluoride AsF_5 directly intercalates graphite to yield a composite $AsF_5/AsF_3/AsF_6^-$ inserted product, which exhibits high molecular mobility within the planes. Strong oxidants as KrF_2, XeF_6, and IF_7 intercalate graphite with correlative formation of covalent C-F bonds. In cases in which molecular fluorine is used, either alone (at 24°C, as done by H. Selig) or with a non-oxidizer as WF_6, one observes a symmetric electron spin resonance signal whose area obeys the Curie-Weiss Law. This behavior, which is in contrast to that found for the graphite/AsF_5 product, suggests that fluorine gas will have a deleterious effect on the electronic conductivity of graphite.