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The spin-probe ESR study of single-walled carbon nanotubes at low temperatures AMARJOT DHAMI, SHRIVALLI BHAT, AJAY SHARMA, S.V. BHAT — Single walled carbon nano-tubes (SWNTs) are ESR silent unless they contain ferromagnetic impurities or conduction electrons. A technique that has been widely used to study ESR silent systems is the so-called spin probe ESR, where a free radical, typically a nitroxide radical, is dilutely doped into the system and ESR studied. In this work, we have incorporated the nitroxide radical TEMPO (2,2,6,6-tetramethyl-1-piperidinyloxy) inside the SWNTs. The ESR spectra were recorded from 5K to 300 K using an X band EPR spectrometer (Bruker ER 200D). The main result of this work is change in dynamics of the probe molecule at 230 K indicated by the appearance of a narrow triplet signal. The ESR measurements were also done on TEMPO in methanol for the comparative studies in the same temperature range, and in the latter observations, no change in spectra was seen around 230K. The origin of the appearance of this narrow triplet at 230 K indicates the possibility of change in some intrinsic property of the carbon nanotube around 230 K, which has been reflected in the motional characteristics of the spin probe. Thus, our studies show that spin probes, which have, till been used widely in biological samples and polymers, can be used for the further studies of carbon nanotubes to investigate their physical properties.

Amarjot Dhani
Indian Institute of Science, Bangalore

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