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A ¹³C NMR Spectroscopic Investigation of Carbon Nanohorns HIDETO IMAI, PANAKKATTU BABU, ERIC OLDFIELD, ANDRZEJ WIECK-OWSKI, DAISUKE KASUYA, TAKESHI AZAMI, YUICHI SHIMAKAWA, MASAKO YUDASAKA, YOSHIMI KUBO, SUMIO IIJIMA, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN TEAM, FUNDAMENTAL AND ENVI-RONMENTAL RESEARCH LABORATORIES, NEC CORPORATION, JAPAN TEAM, SORST, JAPAN SCIENCE AND TECHNOLOGY AGENCY, C/O NEC TEAM, MEIJO UNIVERSITY, NAGOYA, JAPAN TEAM — ¹³C NMR spectroscopic investigation of carbon nanohorn aggregates (CNH) shows that they consist of two components, characterized by different chemical shifts and spin-lattice relaxation (T_1) behavior. The first component with a chemical shift of 124 ppm and faster T_1 is assigned to the nanotube-like horns on the particles' surface. The second component with a chemical shift of 116 ppm and much slower T₁ is assigned to the graphite-like part of the CNH. Integrated peak area measurements indicate a 1:2 ratio of nanohorns to the graphite-like substrate. The lack of a Knight shift and the absence of a clear Korringa relaxation for either component of T₁ ruled out any metallic behavior and indicate a relaxation behavior characteristic of semiconducting materials with paramagnetic centers arising from structural defects. We also observed an anomalous change in T₁ in the nanohorn domains near 17 K, suggesting the development of an antiferromagnetic correlation between localized electron spins.

Panakkattu Babu University of Illinois at Urbana-Champaign

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