Inelastic neutron investigations of AC_{60} compounds with $A=Li_4$, Mg_2 and C_8H_8

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The research on the so called fulleride compounds (fullerene based material) has been extensively conducted for almoSt two decades now. One has to find the reason for this longevity in the exciting electronic and transport properties of these materials, ranging from high Tc superconductivity to molecular magnetism. It provides also almoSt perfect molecular models of novel organization, and the recent advances in synthesis resulted in the discovery of new phases of upmoSt interest In this presentation we will focus on the dynamics of two of these novel form of fullerides, investigated by inelastic neutron scattering:

1) Li_4C_{60} is a stacking of polymeric fullerenes linked by covalent [2+2] double bridges in one directions and one single covalent bond in the perpendicular direction. It is a ionic conductor with a very large conductivity allowed by the partial filling of the large octahedral voids found in the structure. This compound is isostructural to the Mg_2C_{60} system which is found to be the moSt resilient fulleride of its family at high temperatures: while moSt of the polymeric fullerides transform to monomer above 600 K, Mg_2C_{60} is observed to be stable up to 1000°C. We will discuss these peculiarities in parallel to their structure and dynamics.

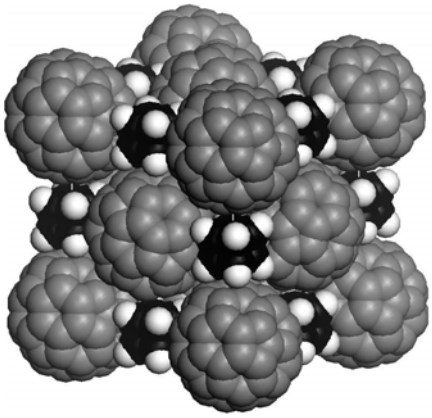

Figure1. The fullerene-cubane "rotor stator" molecular system: at ambient conditions, the fullerene molecule is a rotor-rotating freely around its center-while the stator cubane acts as static bearings.

2) The laSt system that will be discussed concerns the rotor-stator co-molecular crystal, which is composed of cubane molecules inserted in between C_{60} at the octahedral sites in the FCC lattice. It is found that this peculiar arrangement of these highly symmetric molecules provides this system with a specific dynamics where the C_{60} perform faSt rotation while the cubane molecules remains orientationally fixed.