Abstract

This PhD. thesis reports on the study of two new types of strongly correlated molecular materials where the base molecular blocks are either fullerenes or phthalocyanines. Different experimental techniques like X-ray diffraction, Nuclear Magnetic Resonance, SQUID magnetometry, and muon spin relaxation (μSR) were employed.

The experimental work was mainly focused on the structural investigation of the fullerenium salt $C_{60}(AsF_6)_2$, a new type of fullerene based material where C_{60} is present in its oxidized form C_{60}^{2+}, synthesized for the first time in our chemistry laboratory. We found that the C_{60} units, in $C_{60}(AsF_6)_2$, polymerize through [2+2] cycloaddition and display a unusual *zigzag* arrangement which has never been observed, so far, in the fullerene polymers.

Part of this work was also devoted to the investigation of the electronic properties of lithium phthalocyanines (LiPc, Li_2Pc) and their lithium-intercalated phases, with the aim to shed more light on the possible analogy between these compounds and the *fullerides*, the well known charge transfer C_{60} salts where the electronic properties can be tuned by varying the stoichiometry of the intercalated alkali atoms. In particular a preliminary lithium intercalation has been performed on Li_2Pc and the new lithium-doped phases Li_2Li_2Pc and Li_3Li_2Pc have been obtained.