Impact of nondipole effects on spin-polarization of photoelectrons from fullerene anions

A. EDWARDS, C. LANE, V. DOLMATOV, University of North Alabama — The present work provides the initial insight into the impact of a nondipole part of low-photon-energy photodetachment on the degree of spin-polarization (SP) of photoelectrons from fullerene anions C$_N^-$. This problem is interesting. A fullerene anion has a much bigger size than that of a free atom, and a C$_N$ cage is a resonator to the outgoing photoelectron wave. All this might increase significantly the impact of nondipole effects on the degree of photoelectron’s SP from C$_N^-$s. The study focuses on the impact of an electric dipole-quadrupole (E1-E2) part of photodetachment on the degree of photoelectron’s SP from C$_N^-$s with progressively increasing sizes: $N = 60, 240, 540,$ and $1500$. The focus is on a very low, only few-tens-eV photon-energy domain. Different photoelectron angular- and spin-geometries are considered. Calculations are performed in a model approximation, where a C$_N$ cage is modeled by a spherical-well potential. It is demonstrated that the contribution of E1-E2 effects to the degree of photoelectron’s SP from C$_N^-$s can be on the order of 10%, at certain energies. Importantly, this is found to occur at only few-tens-eV-photon-energy, in contrast to hundreds-eV-photon-energy in the case of atoms.