Isomeric and Isotopic effects on survival of Tm- and Eu-metallofullerenes at neutron activation

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Possible processes of decay of excited states of molecules of endohedral metallofullerenes are very interesting both from pure and applied point of view. Neutron activation of metallofullerenes gives primarily highly exited molecule with radioactive atom inside the carbon cage. The following decay of the molecule can result in either survival of metallofullerene or its destruction. Recently it was supposed that fast electronic mechanisms, probably of shake-off type, could be responsible for high survival probability in some cases [1]. Theoretical study of decay processes of endohedral fullerene molecule at photoionization of the atom enclosed shows possibility of ultrafast electronic interatomic decay and that interatomic decay does not necessarily lead to the destruction of the metallofullerene molecule [2]. It is reasonable to suppose that electronic structure of the cage and nature of the primary excitation of encapsulated atom can affect the survival probability as a net result of decay processes.

We have studied the survival of two $Tm@C_{82}$ isomers and Eu-metallofullerenes at neutron capture by endohedral atom. Tm and Eu in monometallofullerenes are both divalent like to $Sm@C_{2n}$ **,** where unusually high survival at neutron capture was observed [1]. $Tm@C_{82}$ isomers I and III were separated by two step HPLC on BuckyPrep columns (Nacalai Tesque Inc.). They have different cage symmetry and accordingly different electronic structure. Eu- metallofullerenes were neutron irradiated without preliminary separation, as-prepared, to look for difference in overall survival of $Eu_x@C_{2n}$ due to difference in prompt gamma ray spectra at activation of naturally abundant isotopes 151- and 153-Eu. The measured values of retention yields are discussed.

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