

Aqueous Molecular–Colloidal Solution of Fullerene C₆₀: Peculiarities for Luminescence

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Water soluble forms of pristine fullerenes are very perspective for medical and biological applications [1]. Highly stable (8-24 months and longer) and finely dispersed colloidal solutions of fullerenes C₆₀ in water (FWS) without any stabilizers and with maximum concentration of ~4 mg/ml have been prepared [2]. The fact that FWS consists of individual molecules of C₆₀ and the water only has been proved earlier by means of different experimental methods.

The new luminescence band of halfwidth 1700 at 18740 cm⁻¹ frequency peak was observed in these FWS excited by 22645 cm⁻¹ He-Cd laser line. Such luminescence is not observed in thin crystal-like films of C₆₀ as well as in benzene solutions of C₆₀. It is supposed that the origin of this luminescence lies in formation of ordered sphere-like hydrated shells around C₆₀ molecules with weak charge-transfer interactions of C₆₀ and oxygen ions of H₂O accomplished with H-bonding of these water molecules. The water ordered shell model is confirmed indirectly by recent studies of FWS by means of Low Temperature Differential Scanning Calorimetry and Small Angle Neutron Scattering.

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