

Synthesis of Fullerene Nanorods for Detection of Ethylparaben an Endocrine Disruptor in Cosmetics

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Abstract : Chemical modification and assembling of fullerenes are fundamentally important for the application of fullerenes as functional molecules and in molecular devices and organic electronic devices. We have synthesized fullerene nanorods C60NRs conjugate via liquid-liquid interface and the synthesized C60NRs was characterized by FTIR spectroscopy, field emission electron microscopy (FESEM) and X-ray diffraction techniques. The C60NRs were immobilized on glassy carbon electrode via surface bound diazonium salts as an impact strategy. This method involves electrografting of p-nitrophenyl to give GCE-Ph-NO₂ and then the terminal nitro-group was chemically reduced to GCE-Ph-NH₂ in a presence of sodium borohydride/gold-polyaniline nanocomposite (NaBH₄/Au-PANI). The Au-PANI composite was synthesized and characterized by FTIR, UV-vis, SEM and EDX techniques. The C60NRs were immobilized on GCE-Ph-NH₂ via amination reaction which involves N-H addition across a π -bond on [60] fullerene. The immobilized C60NRs/GCE was subjected to electrochemical reduction in 1.0 M KOH to yield ERC60NRs/GCE sensor. The developed sensor shows high electrocatalytic activity for the detection of ethylparaben (EP) over a concentration range from 0.01 to 0.52 μ M with a detection limit (LOD) 3.8 nM. The amount of EP present in the nourishing repair cream (OLAY®) was determined by standard addition method at the developed ERC60NRs/GCE sensor. The total concentration of EP was found to be 0.011 μ M (0.1%) and is within the permissible limit of 0.19 % EP in cosmetics according to the European scientific committee (SCCS) on consumer safety on 22 March 2011 (SCCS/1348/11).

Keywords : diazonium salt reduction, ethylparaben (EP), endocrine disruptor, fullerene nanorods (C60NRs), gold-polyaniline nanocomposite (Au-PANI)

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