



Photoluminescence properties of single-walled carbon nanotubes modified with Stable Organic Radicals.

J. Alejandro de Sousa^{a,b}, Felix J. Berger^{c,d}, Nicolas F. Zorn^{c,d}, Abdurrahman Ali El Yumin^{c,d}, Aleix Quintana García^a, Simon Settele^c, Núria Crivillers^a and Jana Zaumseil^{c,d}

a-Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), Campus UAB, 08193 Bellaterra, Spain

b-Laboratorio de Electroquímica, Departamento de Química, Facultad de Ciencias, Universidad de los Andes, 5101 Mérida, Venezuela

c-Institute for Physical Chemistry, Universität Heidelberg, 69120 Heidelberg, Germany

d-Centre for Advanced Materials, Universität Heidelberg, 69120 Heidelberg, Germany

Abstract:

Perchlorotriphenyl methyl (PTM) radical is a stable persistent organic free radical with several interesting properties. This radical is paramagnetic, redox active, fluorescent and chiral. ^[1,2] PTM radical has been grafted on different surfaces (silicon, gold, ITO, HOPG) via alkyl, thiol, silane and diazonium salt groups, respectively). ^[3,4] Recently PTM-based surfaces have been investigated as redox-capacitor and paramagnetic switches and molecular wire, among others ^[3,5,6]. In order to expand its applications, we have modified single-walled carbon nanotubes (SWCNTs) via diazonium chemistry, being this, the first example of SWCNTs covalently modified with PTM radicals. ^[7]

It is well known that diazonium salts react with SWCNTs generating luminescent sp³ defects (also called quantum defects or organic color centers), with their characteristic red-shifted emission and long photoluminescence (PL) lifetimes enabling higher PL quantum yields and single-photon emission at room temperature. ^[8] In this work, the PL studies performed reveal that the presence of the radical leads to partial quenching of the sp³ defects PL. The mechanism to explain this phenomenon is a combination of a photoinduced electron transfer process and population transfer to triplet states enabled by radical-enhanced intersystem crossing. This result is very promising since it encourages to go deeper in the study of the elusive triplet exciton manifold in carbon nanotubes. ^[7]

Besides, other applications could be envisaged such the encapsulation of this material into biocompatible surfactants as metal-free contrast agents for magnetic resonance imaging complementary to *in vivo* near-infrared fluorescence imaging.

References:

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