

# **Multifunctional nanocomposites between carbon nanostructures and different inorganic materials obtained as thin and transparent films: from preparation to application**

Aldo J.G. Zarbin

*Departamento de Química, Universidade Federal do Paraná (UFPR) Curitiba, PR, Brazil.*

\*e-mail: aldozarbin@ufpr.br

We are reporting during the last years that liquid-liquid (L/L) interfaces are suitable confined medium to both synthesize and stabilize unprocessable materials as thin and transparent films, easily transferable to several ordinary substrates, enabling their studies in thin films-based devices. The innovative synthetic approach to achieve complex materials between carbon nanostructures (carbon nanotubes and graphene) and different inorganic materials (metal nanoparticles, nickel hydroxide, Prussian blue and analogues) through the L/L route will be demonstrated in talk. The transference of the obtained films to different kind of substrates (plastics included), the control of the film characteristics (thickness, transparency, conductivity, adhesion to substrate) and the fully characterization of the materials (using microscopic, spectroscopic and electrochemical techniques) will be discussed. Due this very unique preparation route, the interface and the contact between the carbon nanostructure and the inorganic nanomaterial is strongly optimized, improving the properties of these multifunctional materials as will be demonstrated by their application as: i) transparent electrodes; ii) electrodes for alkaline and ion-Li batteries; iii) electrochromic materials; iv) sensors; v) active layers in photovoltaic devices; vi) SERS substrates; vii) catalysts.

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