Journal of
Materials Engineering and Applications

Abstract

Novel Functional Nanoscaled Bio-Active Composite Tungsten Disulfide (WS2) Nanotubes (f-WS2-INTs) – Innovative Surface Chemical Engineering of Starting Highly Hydrophobic Tungsten Disulfide Nanotubes (WS2-INTs)

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Abstract:

Tungsten disulfide nanotubes (INTs-WS2) are extremely hydrophobic and chemically inert inorganic nanomaterials. Thus-this inorganic nanomaterial usefulness is strongly limited in numerous mechanical hardness and tribology-relating research developments together with subsequent industrial/bio-active end using-applications. Indeed, the covalent versatile linkage of any kind of functional organic and/or biology-relating species remains a quite critical developmental step towards highly innovative high-performance nanomaterials and multiphase composites in the field of essential interfacial versatile chemistries. This covalent functionalization method makes use of highly electrophilic and reactive imminium salts (Vilsmeier-Haack (VH) complexes-electrophilic reactions) in order to enable the covalent introduction of a chemically versatile polyacidic (polyCOOH) shell onto the surface of VH-treated inorganic nanomaterials. Moreover, a significant statistical Design Of Experiments (DoE) multi-parameters methodology has been also developed for highly reproducible global DoE-optimization of this multi-parametric polyCOOH shell generation. Resulting fully characterized functional INTs-WS2 (f-INTs-WS2) have a quite wide potential for use as novel functional nanoscale fillers toward new mechanically strengthened and/or conductive composite polymeric matrices (case of hybrid polythiophene-decorated f-INTs-WS2 nanocomposites).3 Corresponding novel functional nanomaterials/nanoscale fillers have been also shown to be PTT bioactive and non-toxic in preliminary toxicity studies,4 which opens a wide R&D route/progress for relating end-user applications (cellular toxic CNTs nanofillers replacement for example).

Biography:

Prof./Dr. Jean-Paul Lellouche (1981- PhD degree/education in Organic Chemistry field, University La Doua, Lyon - France) moved in October 2000 to the Bar-Ilan University (Ramat-Gan, Israel) - Department of Chemistry & Institute of Nanotechnology & Advanced Materials (BINA) as a Full Professor in synthetic Organic Chemistry/Nano(bio)technology (July 2008) & recently Dpt of Chemistry Head (recent Oct 2017-July 2018 period).

Recent Publications:

1. Jean-Paul (Moshe) Lellouche et al; Ultrasensitive haptoglobin biomarker detection based on amplified chemiluminescence of magnetite nanoparticles, 2020.
2. Jean-Paul (Moshe) Lellouche et al; Disaggregation, stabilization, and innovative functionalization/surface engineering of detonation nanodiamonds via ultrasonication-promoted ceric ammonium nitrate treatment, 2020.
3. Jean-Paul (Moshe) Lellouche et al; Mn-Doped ZnS Quantum dots– An Effective Nanoscale Sensor, 2020.
4. Jean-Paul (Moshe) Lellouche et al; Functionalized Tungsten disulfide nanotubes for Dopamine and Catechol detection in a Tyrosinase-based Amperometric Biosensor design, 2019.
5. Jean-Paul (Moshe) Lellouche et al; Tungsten disulfide-based nanocomposites for photothermal therapy, 2019.

Frontiers in Nanotechnology and Nanomaterials; May 04-05, 2020; Vienna, Austria

Citation: Jean-Paul (Moshe) Lellouche; Novel Functional Nanoscaled Bio-Active Composite Tungsten Disulfide (WS2) Nanotubes (f-WS2-INTs) – Innovative Surface Chemical Engineering of Starting Highly Hydrophobic Tungsten Disulfide Nanotubes (WS2-INTs); Nanotechnology 2020; May 04-05, 2020; Vienna, Austria.