Mechanically Hard Surface-Engineered Tungsten disulfide (WS_2) Inorganic Nanotubes - New Nanoscale Polymer "Nanofillers"

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An innovative method of surface functionalization (***polycarboxylation*** – ***polyCOOH shell***) of tungsten disulfide (WS_2) multi-walled inorganic nanotubes (WS_2 INTs) has been successfully developed using *N*-based electrophilic species (*imminium salt chemistry*). This sidewall polyCOOH functionalization showed extreme chemical versatility. Indeed, it enabled the fabrication of a wide range of *covalent* WS_2 INTs surface modifications (**polyNH$_2$**, **polyOH**, **polySH** as 1st series examples) via (i) polyCOOH chemical activation (EDC, CDI) and (ii) 2nd step nucleophilic substitutions by short *ω*-aminated ligands H_2N-*linker*-**X**, **X** outer surface functionality). Resulting fully characterized functional WS_2 INTs (*f*-WS_2 INTs) have a quite wide potential for use as functional nanoscale fillers toward new mechanically strengthened composite polymeric matrices. Such novel functional nanomaterials/"nanoscale fillers" have been also shown to be non-toxic in preliminary toxicity studies, which opens a wide R&D route/progress for corresponding appropriate end-user applications.

Short CV - J.-P. Lellouche

Prof./Dr. J.-P. Lellouche (Full Professor in Synthetic Organic Chemistry) leads a laboratory dedicated to Nano(bio)technology and Polymer Science. His current R&D activities includes R&D developments in the Materials Science field interfacing with nano(bio)technology, *i.e.*, conducting functional polymers, (b) chemically modified hard nanoscale fillers, (c) UV-photoreactive nano(micro)particles (surface nano(micro)structuration of polymeric coatings, metallic catalytic particles), (d) antibacterial organic/inorganic NPs, and (e) innovative surface modifications of iron oxide (magnetite/maghemite) NPs towards gene silencing (siRNA/microRNA *in vitro/in vivo* delivery).