Analytical nanochemistry in RECOMOL

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As the properties of the matter at nanoscale differ drastically from those at macro- and microscopic range, complex nanoparticles such as silicon nanotubes, gold nanorods/nanoespheres or materials with tailored-made nanocavities, are attracting much interest from researchers in the field of new materials. The core research lines of the Analytical Group of Molecular Recognition (RECOMOL) are devoted to the preparation of metal nanoparticles (Au, Si) with capabilities to perform different functions and to the synthesis and development of specialized nano-structured materials with improved molecular recognition properties (molecularly imprinted materials)[1-4]. In this communication we present a general overview of relevant aspects and results of our current work on:

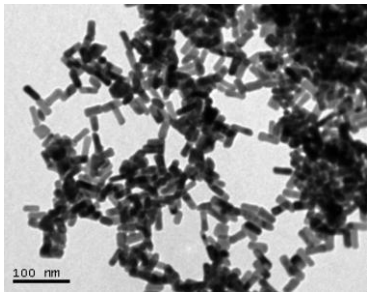

Figure 1. Gold nanorods

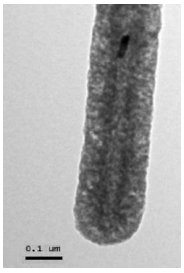

Figure 2. Silica nanotube

1. The synthesis of functional nanoparticles: a) gold nanorods which are synthesized by "seeding" gold nanoparticles (Fig.1), followed by a further functionalization with suitable reagents, thus providing the nanomaterials with capabilities to selectively interact with different target molecules[1,2] and b) Molecularly imprinted silicon nanotubes obtained by Ag nanowire transcription method (Fig.2).

   The new materials are physical, -chemical (adsorption isotherms, TEM, SEM, FTIR and UV-VIS spectroscopy) and analytically characterized. Those nanosystems exhibiting promising analytical potential are applied as nanochemosensors for determination of analytes of clinical/medical and pharmaceutical concern (albumins, amino acids, cancer markers, etc).

2. The development of imprinted materials by using sol-gel approaches against substance P and 5-hydroxyindolacetic acid. We also report our results in blending the chemistry of molecularly imprinted sol-gels with microfluidics applied to the development of smart sensory systems (Figure 3).

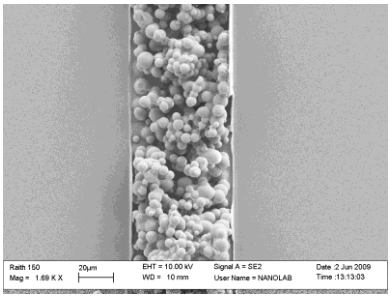

Figure 3. Molecularly imprinted sol-gel modified microchannel

References

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