Application of noble metal nanoparticles for kinetic studies, detection and quantification of uranium phases

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To assess the deep geological disposal that would store the Spent Nuclear Fuel (SNF), several studies have been centered in the SNF itself. It contains all the fission products and radioactive decay, such as I, Cs, Cm, Mo as well as epsilon particles. Moreover, the UO_2 matrix is highly sensible to the redox conditions in its near field and it could be oxidized to the soluble state UO_2^{2+} Therefore, it is mandatory to design new detection methodologies and to evaluate the possible reactions (such as dissolution kinetics) in which SNF could be involved under such conditions. Nevertheless, ε-particles could avoid this oxidation and, therefore, protect the SNF.[1]

Nowadays, it is mandatory to overcome with new efficient and low cost methodologies for the preparation of novel materials. Taking that into account, the incorporation of Nanomaterials such as noble metal nanoparticles (NPs) into bulk components has become a priority. NPs represent an alternative to conventional materials and have repercussion in fields like electronics, biochemical sensors, catalysis and energy. [2]–[5]

In this communication we present the application of different metal noble NPs for different studies related with uranium phases. For example, the effect of Pd-NPs (analogue to ε-particles) on dissolution kinetics of UO_2 under reducing conditions. In addition, the application of Ag-NPs for RAMAN-SERS detection of uranium phases (UO_2 and UO_3) is presented. As future perspectives, we present the preliminary results of an electrochemical sensor based on carbon nanotubes modified with Au-NPs[6], for the quantification of uranyl ion (UO_2^{2+}) in water.

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