Synthesis of ligands for extraction of lanthanides and actinides and their binding to solid supports

The nuclear industry can supply an enormous amount of energy comparing to other sources (i.e. coal, natural gas etc.) but its waste and the storage of enriched elements, should be properly treated – separate the unwanted radioactive elements. Usually for separation of the unwanted elements from the solution a liquid-liquid extraction is used. An organic tridentate ligand, L, complexed with the nine coordination sites of the actinides/lanthanides of the M^{III} cations to form [M^{III}L_3]^{3+} complexes which enables their extraction from its acidic solution to the organic phase.

The ligands used should have an electron rich atom acting as a hard base, e.g. N or O. one of the best ligands for these extractions is the TODGA (tetraoctyldiglycolamine) ligand.¹, in this research we used the DGA (diglycoyl amine) family as ligands.

Liquid-liquid extraction have few disadvantages due to formation of a third phase and solvent dependence². In this research it will be tried to overcome this problem by binding the extracting ligand to a solid support as performed by our group on ion-exchange columns³ (i.e. silica gel or sol-gel) to perform liquid-solid extraction that can occur in any solvent.
One of the synthesized ligands that shows better liquid-liquid extraction properties than the famous TODGA. That ligand was attached to silica gel and to sol-gel matrices and the extraction properties of these matrices are been studied.

References:

