Automated chromatography system for purification of new reagents for An/Ln extraction and separation

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ABSTRACT:

The research in our group focuses primarily on studies of the basic solution chemistry of lanthanides and actinides, emphasizing studies designed to develop new and improved chemical separations processes options for advanced nuclear fuel cycles. Significant portion of this research aims at designing and synthesizing new organic ligands effective for f-element partitioning in solvent extraction systems. Among those ligands are aqueous actinide holdback reagents, oxygen-donor and nitrogen-donor extractants. Our studies build upon current knowledge by using known ligand classes (dipicolinates, diglycolamides and bipyridines) and use novel approaches to adjust and optimize their new derivatives for better solubility, phase transfer kinetics or radiolytic stabilities. A significant fraction of the effort required during the synthesis of organic compounds is dedicated to purification; one of the most common purification techniques being column chromatography. With the current status of our organic synthesis laboratory, chromatography purifications are run manually. Such hands-on column chromatography usually represents a demanding and time consuming stage in organic synthesis, with limited educational value in proportion to the effort required. We propose here the acquisition of an automated flash chromatography system to improve our current ligand purification abilities. An automated system requires little human involvement, dramatically shortens purification time thus increasing the user's productivity, and is more conservative of resources like solvents and chromatographic materials.