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Functionalized nanomaterials for specific lanthanide separations and nuclear wastewater treatment

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Nanomaterials have gained considerable importance due to the needs and applications in almost all areas of human endeavor. Due to the huge specific surface area and absence of internal diffusion resistance; functionalized materials may have superior performance for separation and removing of toxic contaminants from wastewater. The O- & N- donor (*N*-octyl-*N*-tolyl-1,10-phenanthroline-2-carboxaide (OcTolPTA)) contained ligand was synthesized and then successfully immobilized onto mesoporous silica (hybrid materials) by a building-block approach for lanthanide (Ln^{3+}) separation. The coordination chemistry of Ln^{3+} with O- and N- donor ligands has advanced because steric factors can be optimized with ligand set Ln^{3+} contraction by choosing the best metal size from Ln^{3+} . The successful development of potential hybrid materials can serve as promising applications for selective Ln^{3+} sorption and recovery. Also a new class macrocyclic ligand of acetyl dibenzo-20-crown-6-ether (AcDB20C6) was developed and dibenzo-24-crown-8-ether (DB24C8) and AcDB20C6 (inset)) were directly immobilized onto mesoporous silica for Cs containing wastewater treatment. The AcDB20C6 has an ability to identify the Cs ion size based on cation- π interaction. The π electron of the benzene ring in AcDB20C6 has high tendency to interact with d-f hybrid orbital electron of Cs. Moreover, the d-f hybrid orbital is absent in Na and K ions. Therefore, Cs can easily interact with π electron of the benzene ring in AcDB20C6 and Cs can selectively be captured from wastewater even in the presence of the high amount of Na and K ions.

Biography

Md. Rabiul Aual received his PhD degree in industrial and environmental science and engineering in 2008 (Kumamoto University, Japan). He was appointed as an analytical manager in Bureau Veritas Consumers Products Services (BD) Ltd. In 2010, he awarded National Institute for Materials Science (NIMS) Researcher fellowship. He has published more than 50 papers in reputed international journals. His research activity has covered a wide range of novel material preparation and coordination with metals ions specifically lanthanide and actinide, adsorbent materials for specific functional groups and Nuclear wastewater treatment. He is currently appointed a special researcher at Japan Atomic Energy Agency (JAEA), Japan.

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