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Separation of no-carrier-added 109Cd from natural silver target using RTIL 1-butyl-3-methylimidazolium hexafluorophosphate

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The room temperature ionic liquid (RTIL), 1-butyl-3-methylimidazolium hexafluorophosphate [C4mim][PF6] has found application in separation of a range of metal ions replacing volatile and toxic traditional organic solvents in liquid-liquid extraction (LLX) systems. Despite of disadvantage of probable release of HF in acidic reaction, the RTIL [C4mim][PF6] is used widely in developing green processes in analytical chemistry as it is hydrophobic in nature, lacks vapor pressure, and can be synthesized easily. Favorable half-life of 109Cd (461.4 d) allows its use in the field of medical science, environmental science as well as in technology. Several reports are also available on the production and separation of no-carrier-added (NCA) 109Cd. This paper reports the separation of NCA 109Cd from the natAg target using [C4mim][PF6] in LLX. The 109Cd was produced by bombarding a natAg foil (25.4 mg/cm2 thick) by 30 MeV α-particles at the Variable Energy Cyclotron Centre, Kolkata, India. After the decay of all short-lived products, NCA 109Cd was separated from the bulk Ag using [C4mim][PF6] as extractant in combination with HNO3 where ammonium pyrrolidine dithiocarbamate (APDC) was used as a complexing agent. At the optimum condition, 3 M HNO3, 0.2 mL 0.1 M APDC and 1.25 mL [C4mim][PF6], bulk Ag was extracted to the IL phase binding with APDC, leaving ˜ 85% NCA 109Cd in the aqueous phase. The ionic liquid was also recovered by washing the IL phase with 5 M HNO3. The reported separation technique is simple, fast and in concurrence with green chemistry approach.

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