Gas-Phase Adsorption Chromatography of Thallium on Dehydroxylated Fused Silica Surfaces

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Superheavy elements (SHEs, Z 104) hold the key to understanding relativistic effects and their influence on the chemical and physical behavior of particularly heavy elements. Since these effects scale with the atomic number [1], the chemical study of SHEs give insights in the extreme, and thus further our understanding of physicochemical properties of heavy elements in general. The yellow appearance of Au is a classic example of the relativistic influence on physical properties [2]. Unfortunately, SHEs have yet to be found in nature, thus they must be produced with accelerated heavy-ions in very-low-probability nuclear fusion-evaporation reactions. Depending on the target-projectile combinations, the yield of SHEs may be as low as an atom per day or week. Consequentially, preparation experiments with the lighter homologs of the SHE in question are extremely important. With nihonium (Nh, Z = 113) currently attracting the interest of chemists, the lighter homolog thallium is of primary interest. Despite previous Tl experiments preparing for Nh [3], recent attempts at a chemical characterization of the SHE have not yet yielded unambiguous results [4,5]. Presented here are the most recent results from an online isothermal chromatography experiment with short-lived radioisotopes of Tl isotopes. The experiments were conducted at the Tandem accelerator facility of the Japan Atomic Energy Agency through the Japan Society for Promoting Science fellowship program.

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