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Chemistry and physics of the heaviest elements at UC Berkeley and LBNL: An overview

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We are studying the chemical properties of the heaviest elements to explore if relativistic effects cause a noticeable change in chemical behavior compared to their lighter homologues. The heaviest elements are synthesized at the Lawrence Berkeley National Laboratory's (LBNL) 88-inch Cyclotron using the compound nucleus Berkeley Gas-filled Separator (BGS). With the use of the BGS, there is no longer a need for the chemical system to separate heavy elements from interfering activities. This allows development of a very broad range of chemical separation systems that are able to better elucidate the chemical properties of the heaviest elements, and to make the necessary comparison to the chemical behavior of Periodic Table homologues. We are currently expanding the capabilities of the BGS for use of radioactive targets (^{244}Pu, ^{242}Pu). This will give us access to several significantly longer-lived isotopes of elements 104-108 with half lives long enough (^{261m}Rf, 78s; ^{263}Db, 34s; ^{265}Sg, 7s; ^{269}Hs, 10s) for chemical separations in aqueous and gas phases with more complex second generation chemical reaction systems, such as metal-organic-complexes.

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