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Authors
Folden, C.M.
Gregorich, K.E.
Dullmann, Ch.E.
et al.

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Use of the Berkeley Gas-filled Separator to Study Cold Fusion Reactions Leading to the Production of Elements 110, 111, and 107

C. M. Folden III,1,2 K. E. Gregorich,1 Ch. E. Düllmann,1,2 H. Mahmud,1 S. L. Nelson,1,2 G. K. Pang,1,2 J. M. Schwantes,1,2 R. Sudowe,3 P. M. Zielinski,1,2 H. Nitsche,1,2 and D. C. Hoffman1,2

1 Nuclear Science Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720
2 Department of Chemistry, University of California, Berkeley, California 94720
3 Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley California 94720

The production of neutron-deficient transactinide isotopes using cold fusion reactions has been studied in recent experiments with the Berkeley Gas-filled Separator (BGS). These experiments were part of a systematic study of using odd-Z projectile reactions for heavy element synthesis. Targets of $^{208}\text{Pb}$ were bombarded with projectiles of $^{64}\text{Ni}$, $^{65}\text{Cu}$, and $^{55}\text{Mn}$ to produce $^{271}\text{Ds}$, $^{272}\text{Hs}$, and isomers of $^{262}\text{Bh}$, respectively. The excitation function of the $^{208}\text{Pb}(^{64}\text{Ni}, n)^{271}\text{Ds}$ reaction was measured and seven atoms of $^{271}\text{Ds}$ were produced. This result was used to estimate the optimum beam energy for the $^{208}\text{Pb}(^{65}\text{Cu}, n)^{272}\text{Bh}$ reaction, and one decay chain of $^{272}\text{Hs}$ was observed. Lastly, the excitation function of the $^{208}\text{Pb}(^{55}\text{Mn}, n)^{262}\text{Bh}$ reaction was measured and preliminary results will be presented. These results will be characterized in terms of the performance and use of the BGS for heavy element production.
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