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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

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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 $^{208}$Pb were bombarded with projectiles of $^{64}$Ni, $^{65}$Cu, and $^{55}$Mn to produce $^{271}$Ds, $^{272}$111, and isomers of $^{262}$Bh, respectively. The excitation function of the $^{208}$Pb($^{64}$Ni, n)$^{271}$Ds reaction was measured and seven atoms of $^{271}$Ds were produced. This result was used to estimate the optimum beam energy for the $^{208}$Pb($^{65}$Cu, n) reaction, and one decay chain of $^{272}$111 was observed. Lastly, the excitation function of the $^{208}$Pb($^{55}$Mn, n)$^{262}$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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