Prospects for Production of New Superheavy Elements using Projectiles with $Z > 20$ CHARLES FOLDEN, Cyclotron Institute, Texas A&M University — Recent experiments have produced superheavy elements with atomic numbers up to $Z = 118$ in complete-fusion evaporation reactions using projectiles of $^{48}\text{Ca}$, although projectiles with $Z_p > 20$ will be required for the discovery of heavier elements. A systematic study of the reactions of projectiles of $^{44,48}\text{Ca}$, $^{45}\text{Sc}$, $^{50}\text{Ti}$, and $^{54}\text{Cr}$ with a variety of lanthanide targets has been conducted at Texas A&M University. The products of these reactions are spherical, shell-stabilized nuclei near the $N = 126$ shell. Excitation functions have been measured for numerous reaction combinations, and the data show a substantial reduction in cross section for reactions with $Z_p > 20$ compared to the reactions of $^{48}\text{Ca}$ with the same targets. These data have been compared to a simple theoretical model which suggests that the probability of compound nucleus formation and the survival of compound nuclei are both negatively affected by the change from $^{48}\text{Ca}$. In these reactions, significant collective effects decrease the survival of the compound nuclei and defy the assumption that strong shell-stabilization will increase the cross section. These results suggest that the production of new spherical, shell-stabilized superheavy elements with $Z > 118$ could be very difficult. This talk will discuss the most recent results and their implications.

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Date submitted: 30 Jun 2014