Element 108

In 1984 two reports of the successful synthesis of element 108 appeared. The Darmstadt group (G. Münzenberg, P. Armbruster, H. Folger, F. P. Hessberger, S. Hofmann, J. Keller, K. Poppensieker, W. Reisdorf, K. H. Schmidt, H.-J. Schott, M. E. Leino, and R. Hingmann, Figure 22) used the velocity separator SHIP to identify 3 atoms of element 108 (46). The nuclear reaction used was ^{208}Pb (^{58}Fe, n) $^{265}108$ at a ^{58}Fe energy of 5.02 MeV/nucleon which should lead to an excitation energy of 18 ± 2 MeV for the compound system. The cross section for production of these nuclei was 1/10 that observed for the production of element 107 (σ (108) ~2 x 10^{-35} cm^2). Three time-correlated alpha-decay chains that clearly led to known nuclei $^{261}106$ and $^{257}104$ were observed (Figure 23). The observed species $^{265}108$ appears to have a $t_{1/2}$ ~1.8 ms and decays by the emission of a 10.36 MeV α-particle. In a second experiment (47), one atom of the even-even nuclide $^{264}108$ ($t_{1/2}$ ~80μs) was produced in the ^{207}Pb (^{58}Fe,n) reaction. The observation of α-decay by element 108 is taken as a sign that spontaneous fission lifetimes are unexpectedly long for these nuclei, possibly portending the synthesis of still heavier nuclei.

At approximately the same time as the Münzenberg et al. report, Oganessian et al. (48) (Y. T. Oganessian, A. G. Demin, M. Hussonnois, S. P. Tretyakova, Y. P. Kharitonov, V. K. Utyonkov, I. V. Shirokovsky, O. Constantinescu, H. Bruchertseifer, and I. Korotkin) reported the observation of the possible decay of $^{263, 264, 265}108$ produced in the reactions of 5.5 MeV/nucleon ^{55}Mn + ^{209}Bi ($\rightarrow$ $^{263}108$) and ^{58}Fe + $^{207, 208}Pb$ ($\rightarrow$ $^{264, 265}108$). The production cross sections reported by this Dubna group were 1/10 - 1/4 those observed by the Darmstadt group. None of the α-particle decays of these nuclei were observed directly. In the case of $^{264}108$, a 8 ms and a 6 ms fission activity were observed and attributed to the granddaughter of $^{264}108$, $^{256}104$, a known 9 ms spontaneous fission activity. Similarly $^{263}108$ was identified on the observation of a 1.1s spontaneous fission activity attributed to its granddaughter, $^{255}104$, a known 2s spontaneous fission activity. The nuclide $^{265}108$ was said to have been detected because of the observation of α-emitting ^{253}Es, a possible great-great-great-granddaughter of $^{265}108$. Interesting as the observations of the Dubna group are, they are not sufficient by themselves to be a claim for the discovery of element 108 or to be a confirmation of the work of the Darmstadt group. No name has been suggested for element 108.

Element 109

In 1982 G. Münzenberg, P. Armbruster, F. P. Hessberger, S. Hofmann, K. Poppensieker, W. Reisdorf, K. Schneider, K. H. Schmidt, C. Sahm, and D. Vermeulen reported the observation (49), after about 2 weeks of bombardment, of one unusual time-correlated decay sequence that occurred for a reaction product that had been