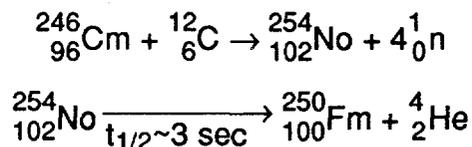


Nobelium (102)

In 1957 a team of scientists from the Argonne National Laboratory in the United States, the Atomic Energy Research Establishment at Harwell in England and the Nobel Institute of Physics in Stockholm announced the discovery of element 102 based upon work done at the Nobel Institute (18). The group reported that in irradiations of $^{244}_{96}\text{Cm}$ with ^{13}C ions accelerated at the Nobel Institute Cyclotron, they found an 8.5 MeV α -emitter with a half-life of about 10 minutes, presumably due to the $^{244}_{96}\text{Cm}(\text{s}(13, 6)\text{C}, 4\text{n})$ or $^{244}_{96}\text{Cm}(\text{s}(13, 6)\text{C}, 6\text{n})$ reactions. They claimed that this activity had been identified as a new element on the basis of ion-exchange chromatography in which the 8.5 MeV activity appeared in the "expected" element 102 position when eluted from a cation exchange column with alpha-hydroxyisobutyrate. The name of nobelium (chemical symbol No) was suggested for the new element in recognition of Alfred Nobel's contributions to the advancement of science.

However, neither experiments at Berkeley (19) nor related experiments at the Kurchatov Institute in Moscow, USSR (20) confirmed this Stockholm work. In fact, subsequent experiments done in Berkeley have shown that the most stable oxidation state of element 102 in solution is +2; thus it would not appear in the "expected" element 102 tripositive position in a cation-exchange column.

In 1958 Ghiorso, T. Sikkeland, J. R. Walton, and I (21) (Figure 16) announced the positive identification of $^{254}_{102}\text{No}$ produced using the Berkeley heavy ion linear accelerator (HILAC) which they attributed to the reactions



The $^{250}_{100}\text{Fm}$ daughter of the new element was collected using recoil techniques, one atom at a time. Eleven atoms of the $^{250}_{100}\text{Fm}$ daughter were identified by their position in a cation exchange elution curve. A half-life of ~ 3 sec was assigned to $^{254}_{102}\text{No}$ on the basis of many recoil experiments in which an apparent α -emitting daughter of $^{254}_{102}\text{No}$ was produced and direct counting of an 8.3 MeV α -emitting nuclide with a 3-second half-life. The 8.3 MeV α -emitter was found also to decay by spontaneous fission in 30% of its decays. It is now known that the 3-second activity originally assigned to $^{254}_{102}\text{No}$ in the direct counting experiments was, in fact, $^{252}_{102}\text{No}$ ($t_{1/2} = 2.3$ sec, $E_{\alpha} = 8.4$ MeV) produced by a $^{244}_{96}\text{Cm}(\text{s}(12\text{C}, 4\text{n}))$ reaction in that the " ^{246}Cm target" used by Ghiorso et al. had 20x more ^{244}Cm than ^{246}Cm in it. $^{254}_{102}\text{No}$ is now known to have a 55 sec half-life.

The experimental claim for discovery of a new element, element 102, however, must be judged upon the observation of the $^{250}_{100}\text{Fm}$ daughter of $^{254}_{102}\text{No}$ because this is the only evidence that establishes the atomic number of the new element. The recoil