*** Name Origin:**

In honor of Ernest R. Rutherford, a New Zealand physicist

*** Sources:**

Bombarding plutonium with accelerated 113 to 115 MeV neon ions. Also by bombarding a target of C249 with C_{12} nuclei of 71 MeV, and C_{13} nuclei of 69 MeV

*** Uses:**

None

*** Additional Notes:**

In 1964, workers of the Joint Nuclear Research Institute at Dubna (U.S.S.R.) bombarded plutonium with accelerated 113 to 115 MeV neon ions. By measuring fission tracks in a special glass with a microscope, they detected an isotope that decays by spontaneous fission. They suggested that this isotope, which had a half-life of 0.3 ± 0.1 s might be ^{260}Rf, produced by the following reaction:

$$^{242/94}Pu+^{22/10}Ne\rightarrow^{260}Rf+4n$$

Element 104, the first transactinide element, is expected to have chemical properties similar to those of hafnium. It would, for example, form a relatively volatile compound with chlorine (a tetrachloride). The Soviet scientists have performed experiments aimed at chemical identification, and have attempted to show that the 0.3-s activity is more volatile than that of the relatively nonvolatile actinide trichlorides. This experiment does not fulfill the test of chemically separating the new element from all others, but it provides important evidence for evaluation. New data, reportedly issued by Soviet scientists, have reduced the half-life of the isotope they worked with from 0.3 to 0.15 s. The Dubna scientists suggest the name kurchatovium and symbol Ku for Element 104, in honor of Igor Vasilevich Kurchatov (1903—1960), late Head of Soviet Nuclear Research. The Dubna Group also has proposed the name dubnium for Element 104. In 1969, Ghiorso, Nurmia, Harris, K. A. Y. Eskola, and P. L. Eskola of the University of California at Berkeley reported they had positively identified two, and possibly three, isotopes of Element 104. The group also indicated that after repeated attempts so far they have been unable to produce isotope ^{260}Rf reported by the Dubna groups in 1964. The discoveries at Berkeley were made by bombarding a target of ^{249}Cf with ^{12}C nuclei of 71 MeV, and ^{13}C nuclei of 69 MeV. The combination of ^{12}C with ^{249}Cf followed by instant emission of four neutrons produced Element ^{257}Rf. This isotope has a half-life of 4 to 5 s, decaying by emitting an alpha particle into ^{253}No, with a half-life of 105 s. The same reaction, except with the emission of three neutrons, was thought to have produced ^{258}Rf with a half-life of about 1/100 s. ^{258}Rf is formed by the merging of a ^{13}C nuclei with ^{249}Cf, followed by emission of three neutrons. This isotope has a half-life of 3 to 4 s, and decays by emitting an alpha particle into ^{255}No, which has a half-life of 185 s. Thousands of atoms of ^{257}Rf and ^{259}Rf have been detected. The Berkeley group believe their identification of ^{258}Rf was correct. As of January 1995 it was thought that eleven isotopes of Element 104 have been identified. The Berkeley group proposed for

the new element the name rutherfordium (symbol Rf), in honor of Ernest Rutherford, New Zealand physicist. This name was formally adapted by IUPAC in 1997. Evidence of element 104 was first detected at the Joint Nuclear Research Institute at Dubna (USSR) in 1964 by bombarding plutonium with accelerated 113 to 115 MeV neon ions. By measuring fission tracks in a special glass with a microscope, the scientists detected an isotope that decays by spontaneous fission. The isotope was thought to be ^{260}Rf with a half life of 0.15 to 0.3 seconds. It was not until 1969, however that the group in Berkley were able to chemically separate element 104 and positively identified two possibly three isotopes of the element. In August of 1997 the International Union of Pure and Applied Chemistry announced the official naming of this element as Rutherfordium with the atomic symbol of Rf. The IUPAC choose Rutherfordium over the Russians' choice of Kurchatovium, which was in honor of Igor Vasilevich Kurchatov (1903-1960), former Head of Soviet Nuclear Research.