

HISTORICAL SURVEY OF TECHNETIUM STUDIES

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It is said that "The mind of a person learning a new science has to pass through all the phases which the science itself has exhibited in its historical evolution(S.Cannizzaro)". Historical survey of studies concerning with technetium are made from the following five points of view.

- 1) Technetium as a missing element.
- 2) Technetium as new artificial radioactive nuclei and their productions.
- 3) Technetium as an inorganic element and a target for analytical chemistry.
- 4) Technetium as an element with application aspects and coordination compounds.
- 5) Technetium as cosmogenic products and environmental radioactivity.

1) In 1871, Mendeleef pointed out in the vacancy in his periodic table of chemical element the existence of a missing element called as "Eka-manganese". Before and after this mention, various reports on new elements concerning with this were made as follows. Osann(1828), "Polinium" in platinum ores(may be ?Ir); Hermann(1846), "Ilmenium" in niobium and tantalum mineral(?impure Nb); Rose(1846), "Pelopium" in mineral tantalite(?impure Nb); After Mendeleef, Kern(1877), "Davyum" in platinum ore(?Ir, Rh, Fe); Barriere(1896), "Lucium" in monazite sand(?mainly Y); Boucher's new element(1897) in boiler dust, cast iron and pig iron(? Mo); Ogawa(1908), "Nipponium" in mineral thorianite(? Hf); Gerber(1917), Neo-molybdenum in molybdenum ores; Bosanquet and Keeley(1924), "Moseleynum" in manganese ores; Tacke, Noddack and Berg(1925), "Masurium" in platinum ores and columbite; Moseley(1913) ascertained by X ray spectroscopy that the atomic numbers of molybdenum and ruthenium were 42 and 44 respectively. According to Mattauch's rule(1934), stable isobar pairs of neighbouring elements do not exist. As Mo-94, -95, -96, -97, -98, -100 and Ru-96, -98, -99, -100, -101, -102 were all stable, it became that the stable isotope of the element 43 would not exist. [1][2]

2) For the transmutation of the chemical element, an accelerating machine of ion beam, "cyclotron", was developed since 1930 by E. Lawrence at Berkeley, USA. The molybdenum plate bombarded for some months by a strong deuteron beam was sent to C. Perrier and E. Segrè at Palermo, Italy on Dec. 17, 1936 and they started the chemical studies on Jan. 30, 1937 by adding rhenium and manganese as carriers. They firstly reported on June 30, 1937, the discovery of the unknown element 43 whose chemical behavior closely resembled to rhenium but for the volatility in a hydrochloric acid current. After the discovery of nuclear fission in the end of 1938, the element 43 was found also among the fission products of uranium in 1940. In 1947, the element 43 was named "Technetium"(Tc). The firstly discovered isotopes of this element are assigned to be  $^{95m}\text{Tc}$  [half-life 61d] and  $^{97m}\text{Tc}$  [90 d] produced by  $^{94}\text{Mo}(d, n)$  and  $^{96}\text{Mo}(d, n)$  respectively. Successively,  $^{93}\text{Tc}$  [2.75h],