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Search of rare reaction channels with proton evaporation

Experiments on synthesis and study of superheavy elements (Z ≥ 110) isotopes radioactive properties are conducted in the laboratory of nuclear reaction more than 20 years. Complete fusion reactions of accelerated 48Ca beam with heavy target nuclei are generally used. Superheavy elements isotopes (SHE) synthesize in the complete fusion reaction of heavy ions with target nuclei with followed neutron evaporation from excited compound nucleus. Complete fusion reactions with neutron evaporation can be used for limited SHE isotopes number synthesis. This is due to we have limited number transuranic elements isotopes which are used as a target.

Summary

Exotic reactions with proton and several neutrons evaporation must be used in order to get more neutron-rich superheavy events isotopes. For example in 48Ca+ 248Cm reaction through p3n channel we get 292Mc, whereas in a forward reaction 48Ca+ 243Am possible to get only 288Mc, 289Mc isotopes. Only one experiment on p3n channel search from 242Pu+ 18O ⟶ 260 Md*reaction is known from references. Experiments series have conducted in the more light nuclei region using 22Ne+ 194,196,198Pt ⟶ 216,218,220Ra* [1] reaction on the VASILISA separator with the use of U400 cyclotron, FLNR, JINR. Ra isotopes was synthesized in xn channels, Rn isotopes - in pxn channels. Recently, isotopes production cross section in p3n, p4n channels was investigated by means of 50TI beam and 164Dy target. Cross sections ratio between xn and pxn channels is 10/20/30 according to beam energy. The first experiment on proton evaporation channel search was conducted in the transfermium nuclei region in 2016 FLNR JINR. The p0n channel was found out at excitation energy corresponding two neutron evaporation in complete fusion reaction 50Ti+ 209Bi ⟶ 259Db*,the cross sections ratio is of the order of 500. The next experiment was conducted at energy corresponding four neutron evaporation (255 Db) or p2n channel (256Rf) in the November 2016. The main goal is elaborate study of 104, 105 elements isotopes radioactive decay properties.

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