Hot nuclear matter properties and reaction dynamics

in

intermediate heavy ion reactions

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Abstract

The nature of the hot nuclear matter produced in intermediate heavy ion collisions has been studied, using isotopically separated fragment yield distribution with Z up to 18. The reaction systems studied are ^{64,70}Zn,^{64}Ni + ^{58,64}Ni, ^{112,124}Sn, ^{197}Au and ^{232}Th at 40 A MeV. The coefficient of symmetry, pairing, Coulomb energy terms and chemical potential term relative to the source temperature are studied. A modified Fisher model is used for the study. The contributions of the secondary decay process of the primary hot fragments to these terms in the model are found to be significant. That is, when these terms are derived from the experimentally observed fragment yields, one has to take into account the secondary decay process seriously. The contributions from the secondary decay process were evaluated for these terms. After correcting these contributions on the experimentally observed isotope yields, the yield distribution indicates that the fragment mass distribution at the time of the fragment formation shows a power law distribution with its exponent value of tau~2.3, indicating that the emitting source is at or near the critical point.