MASSES OF NUCLEI FAR FROM THE STABILITY LINE.

E.R. HILF

Institut für Theoretische Kernphysik der Technischen Hochschule Darmstadt

The threefold interest for masses of nuclei far from the stability line is noted: they occur as fragments of very heavy ion collisions, in the r-process of element-synthesis, and in the neutronstar-crust matter [1].

Semiempiric mass formulae reproduce well the A-dependence of exp. known nuclei. But the (N-Z)-dependence between the various proposals differs wildly off the stability line. This could be reduced by a careful fit to the exp. known masses of isobaric nuclei. The respective results for the semiempiric mass-formulae of Cameron [2] and of Myers and Swiatecki [3] are compared.

Theoretically Brückner-type methods applied for finite nuclei have failed up to now to give comparably good results. Even the simpler Thomas-Fermi model for homogeneous nuclear matter applied to heavy nuclei could be fitted to reproduce the A-dependence but then fails principally to reproduce the (N-Z)-dependence simultaneously [4].

Therefore a consistent evaluation of a Thomas-Fermi model is presented [5], valid also in the presence of the strong density gradients at the nuclear surface, where the density falls of in a distance comparable to the nuclear force radius r_o. The foundations, consequences and first results are discussed.

1. El Eid (M.), Hilf (E.R.) to be published 1972

2. Truran (I.W.), Cameron (A.G.W.), Hilf (E.R.), Leysin Conf. (1970) I 275

3. Ludwig (S.), v. Groote (H.), Hilf (E.R.), Nucl. Phys. in press 1972

4. Graeff (S.), Hilf (E.R.) unpublished 1970

5. Süßmann (G.), Hilf (E.R.) unpublished 1970