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# EVAPORATION RESIDUE CROSS SECTIONS FOR THE FUSION OF $^{12}C$, $^{16}O$ AND $^{20}Ne$ WITH $^{27}Al$

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# EVAPORATION RESIDUE CROSS SECTIONS FOR THE FUSION OF $^{12}C$, $^{16}O$ AND $^{20}Ne$ WITH $^{27}Al$

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The fusion cross section plotted as a function of $1/E_{cm}$ has the shape of two nearly straight lines with different slopes and a band in between (1). The high energy part is determined by the critical radius $R_{cr}$ and potential $V_{cr}$ whereas the low energy part depends on the s-wave barrier position $R_B$ and $V_B$. Experimental data that span the whole range of energies are rather scarce (2,3).

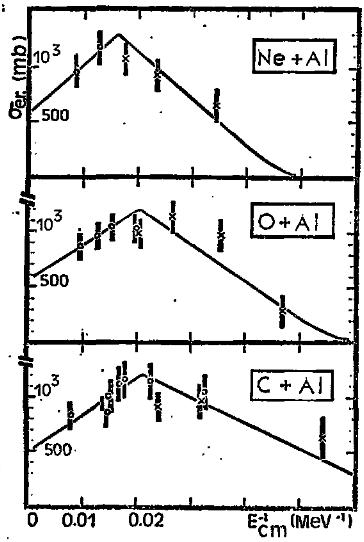
In the present work, measurements for the low energy part of the evaporation residue cross section were performed for the $^{27}Al$ target so as to complement the data obtained at higher energies with $^{12}C$ (4), $^{16}O$ and $^{20}Ne$ projectiles (3). Evaporation residues were detected by a ΔE-E counter telescope consisting of a gas - flow proportional counter (ΔE) and a solid-state surface barrier detector (E) mounted on the internal rear side of the gas counter.

The curves shown together with the data of the present work (cross) and of refs. (3,4) (point) are obtained from calculations using the Glas-Mosel model (1) with $R_{cr} = 0.75\ (A_1^{1/3} + A_2^{1/3})$ fm and $V_{cr} = -70$ ; $-61$ ; $-80$ MeV respectively for $^{12}C$, $^{16}O$ and $^{20}Ne$. The critical parameters for $^{16}O$ and $^{20}Ne$ are taken from ref. (3). The barrier parameters are $R_B = 1.4(A_1^{1/3} + A_2^{1/3})$ fm as in ref. (5) and $V_B$ approximated by

$$V_B = \frac{Z_1 Z_2 e^2}{R_B}\left(1 - \frac{a}{R_B}\right),$$

where a is the nuclear potential diffuseness taken equal to 0.62 fm.

The data are also compared to calculations using the statistical theory and the rotating liquid drop model (6).





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