LETTERS TO THE EDITOR

TOTAL CROSS-SECTIONS FOR THE NUCLEAR SCATTERING OF 765 MeV NUCLEONS

USING the optical model of the nucleus, proposed by Fernbach, Serber and Taylor,[1] Gatha, Shah and Patel[2] have analysed the nuclear scattering of 340 MeV nucleons and obtained a characteristic nuclear density distribution for light elements.

In the present investigation, we have calculated σ_t, the total cross-sections for the nuclear scattering of 765 MeV nucleons using the formula derived by Gatha and Shah.[3] We have taken $\bar{k}_1 = 10$ mbn. from Jastrow's hard core nucleon model which is practially the same as at 400 MeV. The absorption parameter $\bar{K}$ is calculated from the experimental values of $\sigma_{np} = 34{\cdot}4$ mbn.[4] and $\sigma_{nn} = \sigma_{pp} = 45{\cdot}0$ mbn.,[5,6] which in the present investigation comes out to be 39·7 mbn. The calculated values for the total cross-sections using these parameters are given in Table I, together with the experimental values of σ_t at this energy.[4]

TABLE I

Total cross-section in millibarns

Element	Theoretical	Experimental
Li ..	212·8	221·2 ± 4·7
C ..	346·7	342·1 ± 3·7
O ..	444·6	460·7 ± 6·0
Al ..	689·6	660·2 ± 7·3

The above comparison shows that the characteristic nuclear density distribution for light elements and the parameters of the complex refractive index selected in the present investigation gives reasonable values for the total cross-sections for this scattering process.

Bhavan's College, Andheri, Bombay-58, *September* 3, 1960.

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SCATTERING OF HIGH ENERGY ELECTRONS BY CARBON AND OXYGEN

A LARGE amount of experimental data on the elastic scattering of high energy electrons by Carbon and Oxygen is now available. In most cases,[1] the relative values of the differential scattering cross-section have been reported. However, only in very few cases,[2] the absolute values have been given.

Assuming the validity of the Born approximation, Gatha *et al.*[3] have expressed the form-factor $g(\bar{s})$ as,

$$\bar{s}\, g(\bar{s}) = \int_0^\infty \bar{r}\, \rho(\bar{r}) \sin(\bar{s}\,\bar{r})\, d\bar{r} \quad .. \quad .. \quad (1)$$

where $\rho(\bar{r})$ represents the density of protons in the nucleus and

$$\bar{r} = r A^{-1/3}; \quad \bar{s} = s A^{1/3} \text{ and } s = 2k \sin(\theta/2).$$

It follows from equation (1) that if an identical characteristic density distribution $\rho(\bar{r})$ holds good for both Carbon and Oxygen, the graph $g(\bar{s})$ against $\bar{s}$ will be the same for both the elements, for all electron energies.

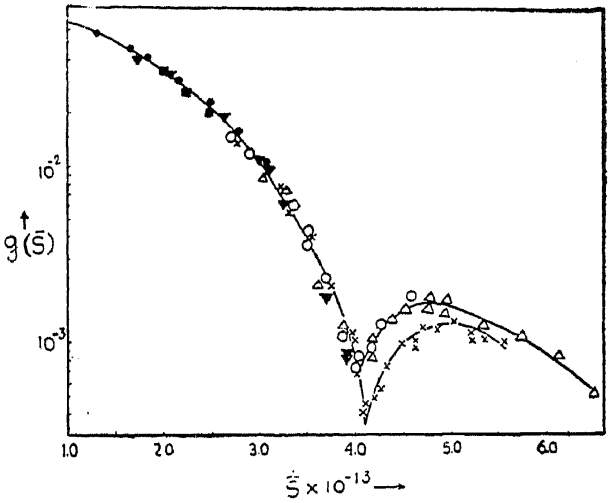

FIG. 1

● C 187 MeV ■ C 150 MeV
× C 420 MeV ▼ O 240 MeV
O O 360 MeV △ O 420 MeV

Figure 1 shows the variation of $g(\bar{s})$ with $\bar{s}$ for Carbon and Oxygen for various values of electron energies. In this connection it may be pointed out that no multiplying factor was found necessary in fitting the relative curves into absolute curves. The curves for Carbon and Oxygen appear to coincide except in the