# SEARCH FOR RESONANCES IN THE $^{32}S+^{28}Si$ SCATTERING

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Due to several factors: low binding energy in the composite system and therefore relatively low level density of compound-nucleus states[1], high-lying first excited states of both reactants, and high grazing moment of inertia, the $^{28}Si+^{32}S$ system appears to be a good candidate for resonance observation[2,1]. As demonstrated in recent studies of the $^{28}Si+^{28}Si$ and $^{24}Mg+^{24}Mg$ systems[3,4], large-angle scattering provides the best probe for resonance observation in heavy f-p shell composite systems.

The present contribution reports the results of measurements of elastic and inelastic scattering of $^{32}S$ on $^{28}Si$, performed recently at the CRN Strasbourg tandem accelerator. The $^{32}S$ beam energy was varied from $E_{lab}$= 92 to 103 MeV, in steps of 0.5 MeV, compatible with the $SiO_2$ target thickness. Emerging heavy particles were detected and identified by means of the kinematic-coincidence method with two large-area position-sensitive Si detectors. The angular region covered at each energy was $\Theta_{cm} \approx 105\text{-}150^o$, and, by virtue of kinematic coincidence, $\Theta_{cm} \approx 52\text{-}85^o$, with resolution better than $1^o$ (c.m.).

Fig. 1 shows excitation functions of the S+Si elastic (Q= 0) and lowest inelastic (Q= -1.95 MeV) scattering cross sections, integrated over $\Theta_{cm}$= 112 to $145^o$ (in the inelastic group, first excited states of Si and S could not be resolved). The two curves are strikingly similar - there is almost one-to-one correlation of peaks and dips between them. However, with the possible exception of the peak at $E_{cm}$= 43.4 MeV, the observed structures are not pronounced.

Fig. 2 shows the backward part of the elastic angular distribution at $E_{cm}$= 43.4 MeV, which is clearly dominated by the L=18 partial wave. Similar oscillatory patterns are observed in angular distributions measured in a wide energy region (~3-4 MeV) around this energy. The period of oscillations in the angular distributions decreases as they are gradually damped with increasing bombarding energy, becoming practically smooth above ~46.5 MeV. The relatively low dominant partial wave at 43.4 MeV (~6-10 ħ less than the calculated grazing value[1]) do not favour a quasimolecular interpretation of the structure at 43.4 MeV. Indeed, results of preliminary optical-model calculations indicate good agreement with the present data. However, further analysis is needed to obtain a more complete understanding of the reaction mechanism.

1. D. Počanić and N. Cindro, to appear in Nucl. Phys. A
2. D. Baye, Phys. Lett. 97B (1980) 17
3. R.R. Betts, S.B. DiCenzo and J.F. Peterson, Phys. Lett. 100B (1981) 117
4. R.W. Zurmühle et al. Phys. Lett. 129B (1983) 384

Fig. 1. Excitation function of $^{32}S+^{28}Si$ elastic and lowest inelastic cross sections integrated over $\Theta_{cm}$= 112-145°. Curves drawn to guide the eye.

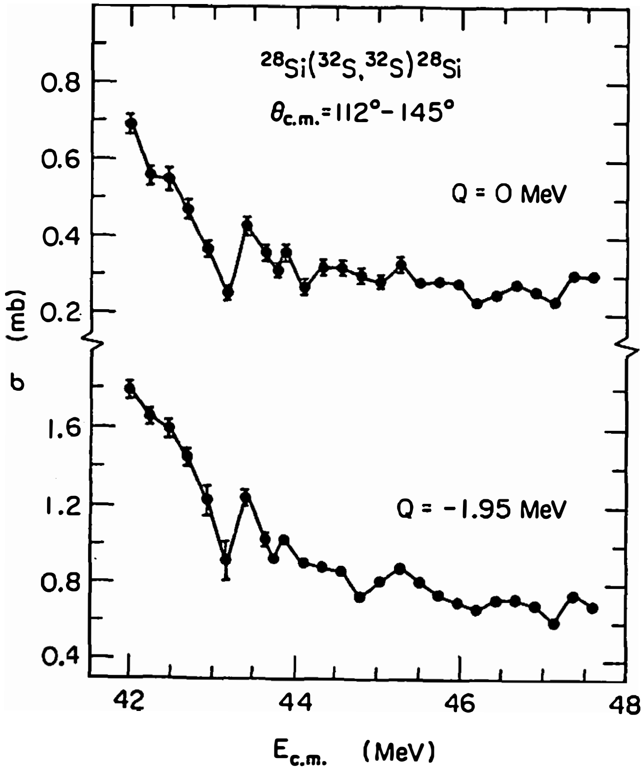


Fig. 2. Angular distribution (back-angle part) of $^{32}S+^{28}Si$ elastic scattering at $E_{cm}$= 43.6 MeV. Solid curve: square of the L=18 Legendre polynomial, $|P_{18}(\cos\Theta_{cm})|^2$.