LEVELS OF THE Si^{30} *NUCLEUS FROM THE* $Si^{29}(d, p)Si^{30}$ *REACTION*

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New data on the 8.149- and 8.571-Mev levels of the Si^{30} nucleus are obtained by measuring on a multispectrograph the energy and angular distributions of protons emitted in the (d, p) reaction.

SOME new data on the levels of the Si^{30} nucleus were obtained during study of the $Si^{29}(d, p)$ stripping reaction on a multi-angle magnetic analyzer, the multispectrograph.[1,2] The bombarding deuteron energy was 6.58 Mev. The 0.5-mg/cm^2 target was composed of 34.9% Si^{28}, 63.7% Si^{29}, and 1.4% Si^{30}.

Figure 1 presents the proton energy spectrum measured at an emission angle $\theta = 20°$.

Because of the insufficient abundance of the isotope Si^{29} in the target, data which we obtained earlier for the $Si^{28}(d, p)Si^{29}$ reaction[3] as well as the results of Browne and Radzyminski's study of Si^{30} nuclear levels[4] were used to identify the proton groups.

A number of Si^{30} nuclear levels discovered by Browne and Radzyminski[4] were confirmed by us.

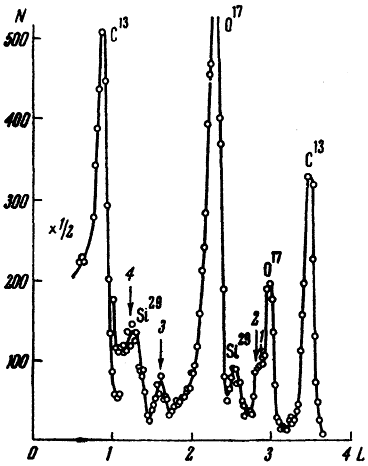


FIG. 1. Energy spectrum of protons emitted at $\theta = 20°$ (N is the number of proton tracks in the microscope field of vision; L is the coordinate along the photographic plate). Proton groups 1, 2, 3, and 4 correspond to Si^{30} states with excitation energies $E_1 = 6.630$, $E_2 = 6.734$, $E_3 = 8.149$, and $E_4 = 8.571$ Mev (E values are taken from [4]).

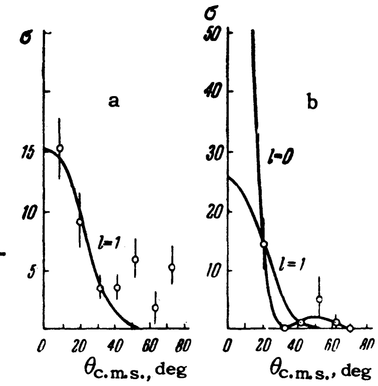
Because of the complexity of the proton energy spectrum (presence in the target of C^{12}, O^{16}, and Si^{28} contamination), some of the proton groups from the $Si^{29}(d, p)Si^{30}$ reaction could not be obtained at all angles; angular distributions have as yet been obtained for only two groups, which correspond to the Si^{30} levels at excitation energies of 8.149 and 8.571 Mev. These are given in Fig. 2.

A comparison of experimental and theoretical[5] angular distributions yielded values for the orbital angular momentum transferred to the final nucleus by the neutron, as well as for final-state spins and parities, which are presented in the table.

The presence in the target of a considerable admixture of Si^{28} allowed us to compare the probabilities of neutron "sticking" in the p-state of Si^{29} and Si^{30} nuclei, since both proton groups were obtained in the same experiment.

The last column of the table gives the neutron "sticking" probability Λ_n,[5] taking as unity the

FIG. 2. Angular distributions of proton groups corresponding to various levels of the Si^{30} nucleus: a) group 3, $E_3 = 8.149$ Mev; b) group 4, $E_4 = 8.571$ Mev. The solid curves are calculated from the formula of Bhatia et al.[5]



Final nucleus	Excitation energy, Mev	l_n	Possible values, I, π	Shell model configuration	Λ_n
Si^{29}	4.93	1	$3/2^-$	$2\,P_{3/2}$	1
Si^{30}	8.149		$0^-, 1^-, 2^-$	$(2\,S_{1/2})^1\,(2\,P_{3/2})^1$ or $(2\,S_{1/2})^1\,(2\,P_{1/2})^1$	0.43 ± 0.20
Si^{30}	8.571	1 or 0			

magnitude of Λ_n for the $2P_{3/2}$ state of the Si^{29} nucleus.

Study of the (d, p) reaction on isotopically enriched silicon will be continued.

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297