curve following the heating to 1000°C in vacuum (curves *a* or *d* in Fig. 1) is characterized by: (1) a shift in the ultraviolet cutoff from about 3700A to 3200A, and (2) the appearance of a sharp absorption peak at about 4000A.

Tentatively, we relate this absorption peak to the presence of excess thorium (oxygen deficiency) of the specimen. Consistent with this hypothesis are weight changes, which are found when alternating the 1000°C oxygen and 1800°C vacuum treatment. The weight changes account for intake or release of approximately 10^{18} oxygen atoms per cc. The weight changes have been checked by gas analysis. No measurable weight changes, however, could be found, when the 1000°C oxygen and 1000°C vacuum treatment were alternated. We refer to these crystals as oxygen-rich. Oxygen-rich crystals bleached in vacuum or hydrogen turn red when exposed to light in the region just beyond the cutoff. The trapping centers for the radiation-produced reddening are shallow; bleaching occurs at 200°C in vacuum.

Another variety of color is obtained by rapid quenching which results in a deep black color. These crystals are opaque in the measured spectral range from 0.2 to 2μ.

No photoconductivity has been observed for any of the described crystals at light intensities, where that of diamond is easily detected.

Measurements pertinent to the mechanism of electrical conductivity of oxygen-poor thoria specimens have been recently published.[1] In this case part of the current is electrolytic, causing rapid decomposition of the crystal. Measurements of electrical conductivity with oxygen-rich crystals were made at 1100°C in oxygen of atmospheric pressure. In contrast to the oxygen-poor specimen, no electrolytic decomposition is detected.

It is a pleasure to acknowledge the services of Harry Bleecher, who developed the necessary polishing techniques and prepared the specimens.

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Evidence for a New Level in Be^7

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The study of the energy levels of mirror nuclei is one of the most effective ways of testing the hypothesis that proton-proton and neutron-neutron forces are equal in the low energy region. In several cases it has been possible to demonstrate very close similarities between the level spectra of mirror nuclei and also to account fairly well for the apparent differences in excitation of corresponding levels.[1–4]

In the case of the mirror nuclei Li^7 and Be^7 the correspondence of the ground states and first excited states is already well established,[5] and there is some evidence that there are levels in Li^7 corresponding to levels at about 6.4 and 7.3 Mev in Be^7.[6] Franzen and Likely[7] were probably not able to observe the 7.54-Mev level in Li^7 by the inelastic scattering of protons on Li, since the protons coming from a (p, pn) reaction produced too much background at that energy. Recently a new level has been found[8,9] in Li^7 at 4.62 Mev. The corresponding region of excitation in Be^7 has not previously been adequately explored, and it was therefore of some interest to discover whether or not there is a mirror level.

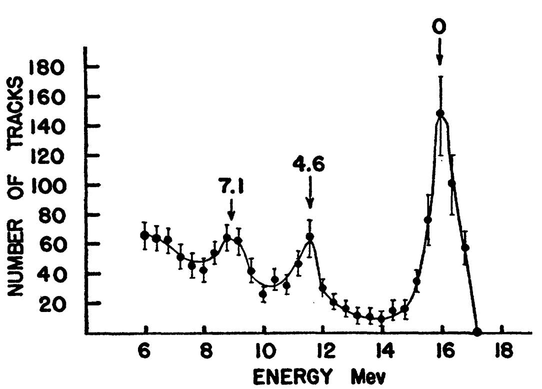

FIG. 1. Neutron spectrum from $Li^7(p, n)Be^7$ at 16°, corrected for escape and for the variation of $n-p$ cross section (about 1000 tracks; bombarding energy = 18.2 Mev).

In the present work 18.3-Mev protons from the external beam of the Princeton cyclotron bombarded natural metallic lithium targets 0.006 in. in thickness. Neutrons produced by the reaction $Li^7(p, n)Be^7$ were detected at 16° and 60° to the incident beam by the proton recoils they produced in Eastman Kodak NTB emulsions of 200-microns thickness. Tracks were accepted up to angles of 15° in the neutron direction in the plane of the emulsion and up to about 11° in dip. About 1000 tracks were counted at each angle. The neutron spectrum at 16°, suitably corrected for the escape of long tracks and for the energy dependence of the neutron-proton scattering cross section, is shown in Fig. 1. Besides the ground-state group which also includes the transitions to the first excited state at 0.43 Mev which could not be resolved and a continuous background probably due mainly to three-body breakup of the compound nucleus, the spectrum shows evidence for excited states in Be^7 at 4.6 Mev and 7.1 Mev. The spectrum obtained at 60° showed the same groups with energies consistent with their arising from the $Li^7(p, n)Be^7$ process. The 7.1-Mev level can be identified with that found from proton scattering on Li^6,[6] and the 4.6-Mev level as the mirror of the 4.62-Mev level in Li^7.

The energy of the new level in Be^7 cannot be determined very accurately from the data. The range energy relation in nuclear emulsions depends somewhat on the humidity of the atmosphere in which they are exposed, and in this work the energy of the ground state group at 16° was calculated and used to determine one fixed point on the range-energy relation; the rest of the curve being assumed to have the same shape as that used by Richards *et al.*[10] Since the ground-state group is composite and the relative strength of the two components is not known, it is possible that an error of up to 200 kev may be introduced into the estimate of the energy of the excited level. The best estimate that can be given for the excitation energy is therefore 4.6 ± 0.2 Mev. Within the somewhat large experimental error, this is the same as the excitation of the corresponding level in Li^7. No useful comparison of the energies of the two levels can be made until the energy of the Be^7 level is known with greater precision.

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T-Tracks in Nuclear Emulsions*

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In emulsions exposed[1] for about 5 hours at 15 g/cm^2 and geomagnetic latitude 41°N, we have observed examples of novel but puzzling events which we call *T*-tracks. A *T*-track appears as a black track with its last grain crossed by a straight thin track, the last grain being at the end of the dense track corresponding to the end of travel of the heavily ionizing particle, which we call