

Fig. 1. ●—●—, iron crucible; ○—○—, alumina crucible

by aluminium, the metals were melted in iron crucibles under argon which had been passed through a considerably enlarged purifying train to remove oxygen, nitrogen and water. Minimum preparation times were employed; the crucible was raised to the casting temperature before inserting the magnesium, and the lithium was added to the molten metal from a wire cradle without opening the apparatus. Casting also took place in the same enclosed apparatus, and the alloys were adequately protected from the atmosphere at all stages. The diffraction patterns showed only a few extra lines, of intensity considerably less than those observed for alloys 1-3. The few extra lines corresponded exactly with the strongest lines in the pattern of the oxidized specimen; their intensities did not vary with the amounts of α and β present. The striking reduction in the number and intensity of the extra lines by greater care in alloy preparation confirms that the effects arise from contamination, and not from superlattice formation.

Fig. 1 shows the lattice spacings (kX, at room temperature) obtained from the second series of alloys. For comparison, two measurements made on alloys prepared in alumina crucibles are included; one of these is clearly inconsistent with the results for alloys 4-7. The $(\alpha + \beta)/\beta$ boundary at 200° C. deduced from Fig. 1 lies at 30.3 atomic per cent lithium, which is not consistent with the extrapolation of the boundary reported at higher temperatures by Catterall².

As noted above, the diffraction pattern for alloy 1 indicated the presence of both the β -phase and a cubic structure of unit-cell side approximately 9.7 kX. The systematic absences and the relative line intensities may be accounted for by a structure with thirty-two atoms per unit cell as illustrated in Fig. 2. It is significant that the lattice spacing is nearly equal to $2\sqrt{2}a$, where a is the lattice spacing of the body-centred cubic β -structure. In the basal plane (001) the atomic sites and distances are closely similar to those in the (001) plane of the β -structure; thus the new structure may be regarded as formed by an expansion of the [001] direction in the cubic structure by a factor of $\sqrt{2}$, accompanied by ordering.

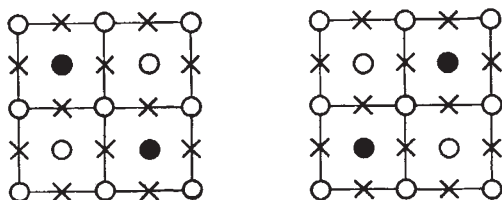


Fig. 2

○, Li } at heights 0 and a
 ●, Mg } at height $a/2$
 ×, Mg at heights $a/4$ and $3a/4$

It is thus equivalent to a body-centred cubic arrangement, in which cube corners and two cube centres out of every eight are occupied by magnesium and the remaining sites by lithium, which has been stretched out vertically. This structure was not observed in the slowly cooled alloys 2 and 3, nor in the uncontaminated alloys 4-7, and is probably to be regarded as a transitional structure due to relatively short annealing times, and stabilized by impurities (oxygen and nitrogen).

It is of interest to note that alloy 8a, after comparably short annealing times, also showed a number of extra lines, which were almost completely absent from the diffraction pattern of alloy 8b. Such extra lines as were observed gave no indication of ordering near the equiatomic composition.

The new evidence available suggests strongly that no ordered structures exist at equilibrium in $(\alpha + \beta)$ alloys, or in alloys of composition in the range 30-34 atomic per cent of lithium, while no evidence for ordering at 50 atomic per cent lithium has been obtained.

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¹ Hume-Rothery, W., Raynor, G. V., and Butchers, E., *J. Inst. Metals*, **71**, 589 (1945).

² Catterall, J. A., *Nature*, **169**, 336 (1952).

Vesicular Laterite

MR. G. AP GRIFFITH'S contribution to the long-debated problem of the origin of vesicular laterite is welcome¹.

I am well acquainted with laterite beds and pavements in Ceylon and eastern and southern Africa, and I am aware of no case in which organic agency need be considered in the production of this very distinctive deposit. An up-to-date study of the subject is provided by Prescott and Pendleton².

More than forty years ago I watched Africans in the Mozambique Territory using laterite pellets, washed out of river banks by ephemeral streams, as shot for muzzle-loaders.

One might here record that both mature and semi-formed laterite can be found in certain places beneath the Kalahari sand in Bechuanaland. Stone implements may be found lying upon it, or otherwise associated with it, and examples of artefacts with fragments of the ironstone adhering to their worked surfaces are not wanting. The laterite so found is pre-Kalahari sand in age, and thus provides striking evidence of the pre-desert climate.

I have no doubt that Mr. Ap Griffith's solution of this laterite problem is correct, so far as it goes. Laterite pellets and nodules can be seen in process of formation to-day; but in many places optimum conditions for the production of vesicular laterite no longer obtain.

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¹ *Nature*, **171**, 530 (1953).

² Prescott, J. A., and Pendleton, R. L., "Laterite and Lateritic Soils". Comm. Bureau Soil Sci. No. 47 (1952).