of the characteristic radiation emitted by the excited atoms, this radiation thus showing a certain degree of coherence. It is clear, however, that a secondary interference of the primary fluorescence radiation must play a part, since a crystal of ammonium

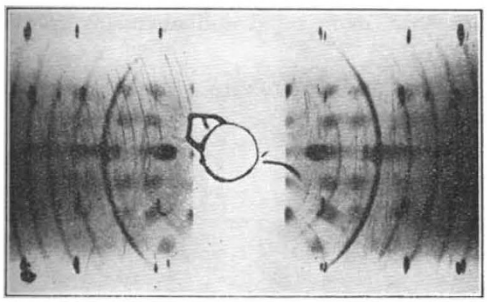

Fig. 1.

nitrate embedded in bromoform and rotating in a beam of 'white' X-rays gave a layer-line photograph of the crystal in question corresponding to the wave-length of bromine K-radiation. As to the question of the coherence of the fluorescence radiation, the modern view on the exciting act makes a certain degree of coherence rather plausible.

We shall deal in a more detailed way also with the theoretical side of the effect in a forthcoming communication.

CHR. FINBAK.
Institute of Physical Chemistry, O. HASSEL.
University of Oslo.
Dec. 12.

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The Existence-Range of the β Hume-Rothery Phases

FROM the data given in Dr. Hansen's recently published elaborate work[1], "Equilibrium Diagrams of Two-Component Alloys", and various other original diagrams, I have tried to find some regularities in the existence-ranges of the β Hume-Rothery phases. The term 'existence-range' indicates that range (expressed by the valency electron concentration) which lies between the maximum and the minimum solid solubilities of the second component in β phases. The accompanying table was obtained. (In this table, the maximum solid solubility in α solid solution and the minimum solid solubility in γ phase are also given.)

The following conclusions can be drawn from this table.

(1) When the atomic size factor is favourable for the formation of electron compounds[2] (Hume-Rothery phases)—according to Hume-Rothery, the size factor is favourable, as long as the difference of the atomic diameters of two components is kept within 15 per cent—the existence-range of the β Hume-Rothery phases are, approximately, 1·37~1·57 for zinc alloys, 1·42~1·58 for cadmium alloys, and 1·38~1·62 for aluminium alloys, respectively. It is a very interesting fact that the existence-ranges are approximately constant, where the second component is the same. For example, in copper-zinc, silver-zinc and gold-zinc systems, the ranges show approximately constant values, namely, 1·37~1·57.

(2) When other factors[2] (such as size factor, negative valency effect, etc.) are favourable, the maximum solid solubility of the second component in α solid solution is a little greater than the minimum solid solubility of the same component in β phase, as can be seen in the systems copper-zinc, silver-cadmium, copper-aluminium, and silver-aluminium. Hence the existence-ranges of α- and β-phases overlap by a few atomic per cent (in most cases 1 per cent). For example, in the copper-zinc system, the maximum solid solubility of zinc in α solid solution and the minimum solid solubility of zinc in β phase are 38 and 37 per cent, respectively.

A similar relation is likely to be found in the existence-range boundaries of β and γ phases, although with less accuracy.

M. HARA.
Institute of Metallography,
College of Science,
Kyoto Imperial University,
Japan. Nov. 7.

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[2] Hume-Rothery, W., "The Structure of Metals and Alloys" (1936).

System	Difference of atomic diameter (per cent)	Maximum solid solubility in α-phase (atomic per cent)	Maximum solid solubility in α-phase (valency electron concentration)	Existence-range of β-phase (atomic per cent)	Existence-range of β-phase (valency electron concentration)	Minimum solid solubility in γ-phase (atomic per cent)	Minimum solid solubility in γ-phase (valency electron concentration)
Cu–Zn	+ 7·7	38	1·38	37 ~ 56	1·37 ~ 1·56	57	1·57
Ag–Zn	− 4·7	38	1·38	38 ~ 57	1·38 ~ 1·57	60	1·60
Au–Zn	− 4·5	31	1·31	36 ~ 57	1·36 ~ 1·57	64	1·64
Cu–Cd	Size factor is not favourable.						
Ag–Cd	+ 5·5	43	1·43	42 ~ 57	1·42 ~ 1·57	57	1·57
Au–Cd	+ 5·7	36	1·36	43 ~ 58	1·43 ~ 1·58	61	1·61
Cu–Al	+ 10·9	20	1·40	19 ~ 31·5	1·38 ~ 1·63	31·5	1·63
Ag–Al	− 1·8	20·6	1·41	19·7 ~ 31	1·39 ~ 1·62	—	—
Au–Al	Existence of β Hume-Rothery phase is doubtful.						

Remarks on the table.

1. As the numerical values of the atomic diameters, those[2] given by Hume-Rothery are used.
2. All the numerical values of the atomic percentage indicated are those of the second component in each system.
3. "Valency electron concentration" means the ratio "valency electrons : atoms".
4. The negative sign of the difference of the atomic diameters means that the atomic size of the second component is less than that of the first component, and the positive sign means that the former is greater.