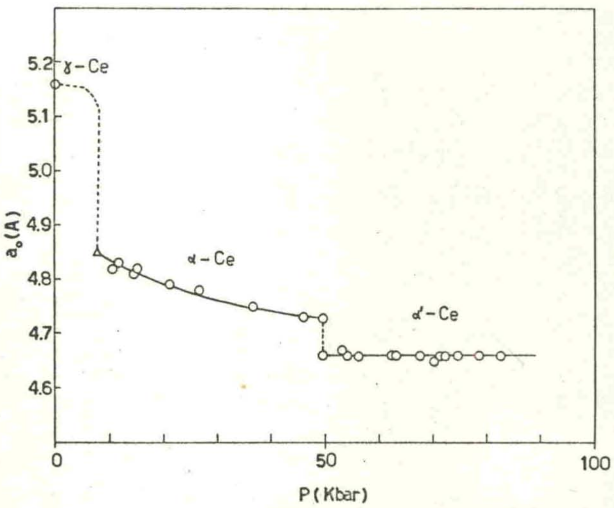

FIG. 1. Lattice constant of cerium, at room temperature, versus pressure. Open triangle, data reported in Ref. 4. Open circles, this work.

$\to\alpha$) can be interpreted only in terms of a change in the electronic configuration of cerium: The contraction in atomic volume determined in this work and the electric properties reported by Wittig[5] allow us to conclude that the valence of cerium must be less than 4 in the α phase and reaches the value 4 in the α' phase. This is also in very good accord with the theoretical predictions of Ratto, Coqblin, and Galleani d'Agliano.[8]

On the basis of this assumption the atomic radius of cerium in the tetravalent state has been calculated from the lattice constant of α'-Ce; its value is $r(\mathrm{Ce^{IV}}) = 1.648$ Å.

The metallic radii of cerium in the hypothetical trivalent state (deduced by interpolation from the behavior of the atomic radii of the trivalent rare earths versus atomic number) in the γ-Ce and α-Ce phases (which are isostructural with α'-Ce) are, respectively, $r(\mathrm{Ce^{III}}) = 1.846$ Å, $r_{\gamma\text{-Ce}} = 1.824$ Å, and $r_{\alpha\text{-Ce}} = 1.715$ Å.

Assuming a linear variation of the atomic radius versus valence between the two ends corresponding to $\mathrm{Ce^{III}}$ and $\mathrm{Ce^{IV}}$, one can deduce that the valency should be 3.11 in the γ phase and should become 3.67 at the $\gamma\to\alpha$ transition.

These results are in good agreement with those deduced through another method by Gschneidner and Smoluchowski.[4]

The authors thank Professor Aldo Iandelli for his helpful suggestions during this work. They are also indebted to Dr. C. Ratto and Dr. C. Rizzuto for many interesting discussions.

*Research supported in part by the Consiglio Nazionale delle Ricerche, Italy.

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ANOMALOUS NUCLEAR SPIN-LATTICE RELAXATION IN THE MIXED STATE OF SUPERCONDUCTING NIOBIUM

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(Received 1 May 1969)

The Nb^{93} spin-lattice relaxation time T_1 in the mixed state of niobium metal has been observed to depart at high temperatures from the temperature and field dependence predicted by the theory of gapless superconductivity. This anomaly indicates either a breakdown of the gapless theory or, more plausibly, the existence of a new relaxation mechanism at high temperatures.

The Nb^{93} nuclear spin-lattice relaxation time T_1 has been measured in the normal and superconducting states of niobium metal in the presence of an applied field. The measurements were undertaken to verify the "gapless" theory of elementary excitations recently reported.[1,2] At high temperatures T and correspondingly low applied fields H_e an anomalously fast relaxation appeared, although for low enough T the predicted dependence of T_1 on H_e and T was observed.

The measurements were made at constant H_e and variable T, and consisted of the usual observation by pulsed NMR of the longitudinal nuclear magnetization $M_z(t)$ at variable time t after an initial saturating train of rf pulses at the Larmor frequency ν_L. For $4.2 < T < 8$°K a variable-tem-