TABLE V. Elastic stiffness coefficients of molybdenum at absolute zero.

Investigation	C_{11}	C_{12}	C_{44}
	All in units of 10^{12} dyn·cm^2		
Present, at −198°C	4.730±0.094	1.562±0.099	1.109±0.0024
Present, linearly extrapolated to −273°C	4.768	1.554	1.111
Average of above = value at absolute zero	4.749	1.558	1.10
Featherston and Neighbours	4.500	1.729	1.250

made for molybdenum. The calculated curve for Young's modulus is shown in Fig. 1 along with the curves of Young's modulus for the single crystals.

Earlier work by the authors[11] included a measurement of the Young's modulus of polycrystalline molybdenum up to 2400°C and a portion of that curve is also shown in Fig. 1. The difference between the experimental and calculated curve is within 2.3% at room temperature and less at higher temperatures.

The shear modulus for this specimen of molybdenum 1.206×10^{12} dyn·cm^{-2} obtained which is in good agreement with the value of 1.245×10^{12} dyn·cm^{-2} calculated from the single-crystal data.

Poisson's ratio was calculated from Young's and shear moduli for polycrystalline molybdenum using Kröner's averaging method and ranged from 0.280 at −200°C to 0.300 at +700°, the room temperature value being 0.293.

CONCLUSIONS

(1) The elastic stiffness coefficients C_{11}, C_{12} and C_{44}, Young's modulus E, the shear modulus G, the derived elastic coefficients, C', K and A, have been determined for molybdenum using a thin-rod resonance technique. Measurements were made on single crystals from −198° to about 600°C and the elastic coefficients were reported from −273 to +700°C.

(2) The elastic properties of molybdenum were normal, decreasing in a nearly linear manner as temperature increased, except for C_{12} and the anisotropy ratio.

(3) C_{12} showed a small but uniform increase as temperature increased.

(4) The anisotropy ratio, A, increased toward unity as the temperature increased, the large decrease in C' with increasing temperature being the controlling factor.

(5) From the experimental data the average moduli were calculated for polycrystalline molybdenum and these also behaved in a manner typical for cubic metals.

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[11] P. E. Armstrong and H. L. Brown, Trans. AIME 230, 962 (1964).