AEC-NASA TECH BRIEF

Measurements of Thermoelectric Power in Annealed and Quenched Gold-Platinum Alloys

Measurements of the absolute thermoelectric powers of dilute gold-platinum alloys, and of the influence of quenched-in lattice vacancies on their thermoelectric powers, have been reported (*1*). The main purposes were study of the phonon-drag component of the thermoelectric power in such alloys as a function of the platinum concentration, and investigation of the change, in their phonon-drag thermoelectric power, caused by quenched-in lattice vacancies.

The specimens investigated contained 0.11, 0.50, 1.03, and 4.99 at .% Pt. The thermoelectric measurements with annealed alloys were carried out between 4.2° and 300°K; with the quenched alloys, between 4.2° and 220°K.

The alloys containing 1 at .% Pt, or less, clearly showed a positive phonon-drag component (S^g) of the thermoelectric power below about 150°K. The positive values of S^g became smaller with increasing platinum concentration. At 20° to 30°K, S^g in these alloys changed its sign and was negative at very low temperatures. It is suggested that the appearance of a negative phonon-drag thermoelectric power in the alloys at very low temperatures is based on the anisotropy of the relaxation times for electron scattering.

Quenched-in lattice vacancies reduced S^g in the alloys containing 1 at .% Pt or less. The reduction of $/S^g/$ due to vacancies was very pronounced at low temperatures where the S^g in the annealed alloys was negative. This is explained by the anisotropy of the electron scattering by vacancies, which apparently is opposite to the anisotropy of the electron scattering by the Pt ions, thus leading to enhancement of the positive contributions to S^g, at low temperatures, due to vacancies.

The report (*1*) includes the experimental procedures, analysis of the data, experimental results for the annealed and quenched alloys, and discussion of the annealed alloys and the influence of lattice vacancies.

Reference:

1. R. P. Huebener and C. van Baarle, *Phys. Rev.* **172**(3), 699 (Aug. 1968).

Notes:

1. Industrial metallurgists who are contemplating use of these alloys may be interested.
2. Inquiries concerning this innovation may be directed to:

Office of Industrial Cooperation
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Reference: B69-10206
Source: R. P. Huebener and C. van Baarle
Solid State Science Division
(ARG-10303)

Patent status:

Inquiries concerning rights for commercial use of this innovation may be made to:

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