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36. SNAP-8 and SNAP-50 Corrosion Studies

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Corrosion support programs for SNAP-8 and SNAP-50 space-power electrical-generating systems have continued as a joint effort between the Metals and Ceramics Division and the Reactor Division.^{2,3} These *Systems for Nuclear Auxiliary Power* are being developed by NASA and the AEC for use in future space vehicles.

SNAP-8 PRIMARY SYSTEM COMPATIBILITY STUDIES

B. Fleischer

A. Taboada¹

The SNAP-8 primary system incorporates four different structural alloys and a reactor cooled with NaK, fueled with zirconium hydride containing ²³⁵U, and reflected with beryllium. The reactor is designed to operate with surface temperatures in the range of 590 to 775°C and to supply 35 kw of electricity through a boiling-mercury Rankine power-conversion system. All systems are designed for 10,000 hr unattended operation.

A loop program was conducted that entailed operation of $\frac{1}{4}$ th-scale forced-flow loops that closely simulated important features of the SNAP-8 primary system. The structural materials involved in the test systems were chromized Hastelloy N, types 347 and 316 stainless steel, Hastelloy C, and Croloy 9M. Eutectic NaK (78% K) was the heat-transfer medium. The most pronounced performance-deteriorating corrosion phenomenon found was carbon migration from the Croloy 9M to all other portions of the system. This result

and other observations have been reported in detail.⁴

CORROSION STUDIES ON SNAP-50 BIMETALLIC HEAT-REJECTION SYSTEMS

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Our compatibility program on the SNAP-50 electrical generating system has, to date, been in support of bimetallic heat-rejection systems. A loop, consisting of a radiator fabricated from type 316 stainless steel and a heated section made from Nb-1% Zr, was built and operated for a portion of its scheduled lifetime during the previous reporting period.² The test loop, containing eutectic NaK (78% K), operated with a heater outlet temperature of 680°C and a temperature difference of approximately 100°C. The system completed its scheduled 6000-hr operation on March 14, 1966, was dismantled, and is presently being subjected to metallurgical examination.

Removable and permanent specimens had been installed in the heated portion of this loop to provide information on corrosion and mass-transfer rates. After 6000 hr both types of type 316 stainless steel specimens showed no significant weight change. The removable and permanent Nb-1% Zr specimens exhibited very small weight losses, approximately $0.1 \text{ mg cm}^{-2} \text{ month}^{-1}$ average, even though this system was not hot trapped. Interestingly, the refractory-alloy specimens in the inlet portion of the heated section at about 600°C exhibited the maximum weight loss. This probably indicates that these specimens were in the most suitable position to interact with impurities in this non-hot-trapped test system.

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²A. Taboada, *Metals and Ceramics Div. Ann. Progr. Rept.* June 30, 1965, ORNL-3870, pp. 305-11.

³ORNL-3772 (classified).

⁴H. W. Savage et al., *SNAP-8 Corrosion Program Summary Report*, ORNL-3898 (December 1965).