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著者	KIGOSHI Akiichi, STRICKLAND Gerald
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## Monel and Nickel Corrosion in Nonaqueous NO<sub>2</sub>-HF Solutions\*

Akiichi KIGOSHI\*\*

*The Research Institute of Mineral Dressing and Metallurgy*

and

Gerald STRICKLAND

*Brookhaven National Laboratory, Associated Universities,  
Inc., Upton, L.I., New York, U.S.A.*

### Abstract

The corrosion rates of Monel alloy 400 and Nickel 200 were studied in several NO<sub>2</sub>-HF solutions that seem promising for use in reprocessing nuclear reactor fuels. Special probes fabricated of Monel or nickel wire were immersed in solutions containing up to 30 mole % NO<sub>2</sub> and heated in the range 25° to 150°C. The progress of surface corrosion was followed by measuring the change in electrical resistance of the wire probes. In general, nickel was superior to Monel. Increasing concentrations of NO<sub>2</sub> were used, and the first detectable corrosion of Monel occurred in 20 mole % NO<sub>2</sub>-80 mole % HF solution at 150°C. For nickel the conditions were 25 mole % NO<sub>2</sub> and 125°C. In solutions containing 25 and 30 mole % NO<sub>2</sub>, the high initial corrosion rate of Monel gradually decreased to a very low value because of formation of a protective film. This film was strong enough to endure large changes in concentration or temperature. Moisture had a severe effect on vapor phase corrosion of both Monel and nickel. Dissolved UO<sub>2</sub> or the presence of H<sub>2</sub>O increased corrosion in the liquid phase. The effect of stress on surface corrosion was insignificant in the elastic range, but in the plastic range it greatly increased both the initial corrosion rate and total corrosion during film formation. Under the conditions of these studies both Monel and nickel were satisfactory materials of construction.

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\*\* Visiting Metallurgist at Brookhaven National Laboratory, now returned.