

MEASUREMENTS OF THE CORROSION OF TWO ODS ALLOYS BY FLOWING COAL SLAG

John P. Hurley*, John P. Kay,
and Kirk D. Williams

University of North Dakota

Energy & Environmental Research Center

PO Box 9018

Grand Forks, North Dakota 58202-9018

*Phone: (701) 777-5159, Fax: (701) 777-

5181, E-mail: jhurley@undeerc.org

The High-Performance Power System, or HiPPS, program was started by the U.S. Department of Energy to encourage the development of a coal-fired power system that would employ an indirectly fired combined cycle that is one-third more efficient than existing power plants while producing only one-tenth of the emissions. One concept for a HiPPS plant proposed by the United Technologies Research Center employed a very-high-temperature heat exchanger composed of oxide dispersion-strengthened (ODS) alloys that would have to withstand corrosion by flowing coal slag. The University of North Dakota Energy & Environmental Research Center was a major subcontractor on the project, building and operating both pilot-and bench-scale systems for testing the heat exchanger and other concepts key to the operation of such a plant.

In this paper, we present the results of corrosion tests of two ODS alloys cooled to 1000°, 1100°, and 1200°C while exposed to flowing coal slag at 1500°C. The alloys are MA754, a nickel-based chromia former, and MA956, an iron–chromium alumina former. The tests were performed in a bench-scale system in air for 100 hours each. The results presented in the paper include measurements of surface recession and elemental diffusion both within the alloys and between the alloys and the slag.