UCRL-PROC-228828

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March 9, 2007

Materials Science and Technology 2007 (MS&T'07)
Detroit, MI, United States
September 16, 2007 through September 20, 2007

Disclaimer

Abstract prepared for presentation in the symposium "Iron-Based Amorphous Metals: An Important Family of High-Performance Corrosion-Resistant Materials" at the Materials Science and Technology 2007 (MS&T'07) Conference and Exhibition in Detroit, MI, at the COBO Center on 16-20 September 2007

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Metallic amorphous alloys or metallic glasses have been studied extensively for the last three decades due to their unique characteristics, including superior mechanical properties and corrosion resistance. Iron-based amorphous alloys have in general better corrosion resistance than their polycrystalline cousins such as the austenitic 18-8 stainless steel series (e.g. 316L SS). Fe-based amorphous alloys have even higher localized corrosion resistance than the nickel-based Alloy 22 under many laboratory tested conditions. Electrochemical laboratory tests have shown that when polycrystalline alloys such as Alloy 22 are anodically polarized in hot concentrated chloride brines, they dissolve unevenly following patterns associated with their crystalline character. However, amorphous alloys, when polarized to even higher potentials than the polycrystalline alloys, they dissolve in a desirable uniform manner. This is because the amorphous Fe-based alloys do not offer defects in the metal that can be preferentially attacked. Comparative studies will also be presented on the dissolution modes of Ni-gadolinium and borated stainless steels.

ACKNOWLEDGMENTS

This work was performed under the auspices of the U.S. DOE by the University Of California Lawrence Livermore National Laboratory (LLNL) under Contract No. W-7405-Eng-48. Work was sponsored by the United States Department of Energy (DOE), Office of Civilian and Radioactive Waste Management (OCRWM); and Defense Advanced Research Projects Agency (DARPA), Defense Science Office (DSO). The guidance of Leo Christodoulou at DARPA DSO and of Jeffrey Walker at DOE OCRWM is gratefully acknowledged.

RBR, 06March2007