NEUP Nuclear Energy University Programs
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Advanced Nuclear Materials Laboratory Enhancements for Corrosion and Stress Corrosion Testing

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ABSTRACT: Resistance to corrosion and stress-assisted corrosion are major considerations in the choice of materials for structural and cladding components and the assessment/prediction of their in-core lifetimes. Corrosion testing is needed to understand how structural/cladding materials and particularly newly developed advanced materials (proposed in the context of the Accident Tolerant Fuel program for instance) respond in the LWR corrosive environment. The type of technical approach adopted is a coordinated program of corrosion and stress-assisted corrosion testing and characterization, mechanism study, and mechanistic modeling which can be applied to various advanced alloys from Zr based alloys to steels and other advanced materials being considered for Accident Tolerant Fuel applications, all being of interest for NE R&D. Thus, funding is requested, through the DOE NEUP Infrastructure program, to obtain the acquisition of autoclaves and equipment for Corrosion, Stress-assisted Corrosion, and Stress Corrosion Cracking testing of nuclear materials for structural and cladding applications in LWRs, and corrosion studies related to HLW storage packages. The proposed equipment and laboratory enhancements will be used in the performance of research related to existing DOE projects and proposed efforts in the areas of advanced nuclear fuels and materials. The equipment will also be used for the purpose of a laboratory class which is being developed by the PIs for inclusion in the curriculum. The 1 credit Lab is in complement to the 3 credit Nuclear Materials Science class. It will also be of relevance for a class on Corrosion of Nuclear Materials developed by two of the co-PIs at the graduate level which will cover issues related to corrosion and stress corrosion of materials used in nuclear reactors. Henceforward, the requested infrastructure will also enable/enhance the Teaching/Learning Mission of the NE department at NCSU. Overall, through the acquisition of these infrastructures, it is desired to grow NCSU research and teaching programs in the field of Nuclear Materials, train new students for careers in national laboratories and the nuclear industry, enable faculty development, and contribute to critical DOE mission oriented research related to advanced LWR, Gen-IV reactor systems and HLW storage packages.