Yanhong Liu et al., J Material Sci Eng 2017, 6:4(Suppl)
DOI: 10.4172/2169-0022-C1-068

Preparation and properties of protective coating on inner surface of nickel-based alloy tube

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Thorium molten salt reactor (TMSR) is one of key reactors of the generation IV in nuclear power system, and molten salt is used as fuel and coolant in TMSR, therefore it has been put forward a higher requirement for the anti-corrosion ability of tubular structural components in molten salt. In this study, the pulse electroplating was used to obtain pure nickel coating on the inner surface of tubular structural material to improve the corrosion resistance of nickel alloy, however, electroplating on the inner surface of tube is not easy to implement, for example the current is shielded and the anode is deactivated easily, in order to solve these problems we used the inner anode and controlled the deposition time at the same time. Pure nickel coating was successfully obtained and the microstructure and properties of coating were analyzed simultaneously. The thickness, hardness and microstructure of coating were observed by metallographic microscope, macro-hardness tester and field emission scanning electron microscope, and the influence of different deposition durations and annealing treatment durations on properties were analyzed, in the meantime, the thermal shock test was investigated that aim to analyze the adhesion of coating. The results showed that the coating thickness increased linearly with the extension of electroplating duration, and the size of grain gradually grew. The surface of coating became rough as well. The hardness of coating increased at first but decreased finally with the increased of duration. However, the change of hardness was not obvious after annealing. The thermal shock test showed that the coating had good thermal shock resistance and good bonding strength.

Biography

Yanhong Liu has her expertise in surface technology and materials about coating. Her research is based on surface and coating technology for improving the overall performance of materials. She used electrochemistry method to get surface protective coating on energy materials. She was doing research on the surface technology used in the field of nuclear power and new energy field as well. She and her team aims to improve the properties of anti-oxidation and anticorrosion of zirconium alloy cladding using surface technology.

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