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P3.134 Validation of cyanide copper electrodeposited threaded insert for anti-seizing in tokamak vacuum vessel

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Vacuum vessel which is the first confinement barrier of Tokamak fusion reactor should have numerous interfaces such as Blanket, In-vessel-coils, etc. Those interface components should be assembled by fastening of special shape of bolts to the threaded holes in the Vacuum vessel with threaded inserts and to be disassembled for maintenance during Tokamak operation. Threaded connection between Stainless steel housing and stainless steel insert will definitely cause difficulties during installation due to rather large friction coefficient between the surfaces because of fastener loads for the in-vessel components are high and require having identical material for bolts and nuts. In order to solve this issue, threaded surfaces of inserts need to be coated by Cyanide copper for anti-seizing. This coating can aid assembly/disassembly by preventing seizing of parts when low torqueing magnitude or repeatability is not critical. During the Tokamak operations, the coating will prevents seizing from high pressure on the contact surfaces of any component under ultrahigh vacuum (1×10-7 Pa m3s-1 (air equivalent) and high temperature (100 ~ 250℃). The consequences of failure of the coating will be the inability to perform maintenance activities without resorting to recovery scenarios such as bolt drilling. In this study, outgassing, adhesion and porosity and pin-on-disk reciprocating test for Cyanide copper electrodeposited surface on the 316L(N) austenic stainless steel test coupons had been performed in order to validate a high level of confidence in the performance of Cyanide copper electrodeposited threaded insert for anti-seizing in ultrahigh vacuum condition. Consequently, the validation tests was successfully performed and Cyanide copper electrodeposited threaded insert can be applied to the Tokamak vacuum vessel.

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