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P3.195 Properties of low friction anti-seize coatings for fusion applications

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Remote maintenance in fusion machines such as JET and ITER relies on sliding interfaces such as bolted joints. Experience in JET, where removal torques much higher than installation values with uncoated bolts is commonplace, led to the installation of experimental bolted assemblies in 2015: the first of its kind in JET. These assemblies included some 660B stainless steel ITER Blanket-specific bolts with a solid sputtered coating of MoS2. After removal in 2017, tests revealed no pre-load loss and undoing torques similar to the original installation torques: thus confirming that the low friction and anti-seize properties were indeed realised in a tokamak environment.

Parallel activities include measuring the fundamental properties of such coatings, including outgassing, friction and sensitivity to humidity.

A UHV (Ultra High Vacuum) facility (<3 x 10-10 mBar after baking to 200 ⍰C), engineered in the MRF (Materials Research Facility) with a vacuum load-lock facilitates highly sensitive outgassing measurements. Tests have revealed small, but measurable, quantities of H2S from coated samples. Sulphur containing gases are a serious plasma pollutant, so quantifying the outgassing is imperative.

Such coatings are normally used in a dry state but are believed to be moisture-sensitive and could be accidently exposed to moisture in a tokamak. Hence, humidity-exposed samples are also being tested. The friction properties of the samples, along with unexposed control samples, will be measured using the PoD (Pin on Disc) method.

Presenter: THOMPSON, Vaughan (Central Engineering UKAEA)

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