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Tribocorrosion behaviour of CoCrMo in simulated body fluid with applied potential

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CoCrMo alloys have been widely used as implant materials due to their excellent combination of mechanical strength, corrosion resistance and biocompatibility. However, the release of wear debris during service can trigger inflammatory responses in peri-implant tissues, while reactive oxygen species (ROS) generated by the immune response to bacterial infections may alter surface chemistry and wear behaviour. The formation of tribofilms and the accompanying microstructural changes of CoCrMo under electrochemically controlled conditions are not yet fully understood. In particular, the correlation between applied electrochemical potential, tribofilm formation and subsurface microstructural evolution remains unclear.
In this study, we present a detailed investigation of surface microstructural and chemical changes during tribocorrosion tests under different applied potentials, with particular attention to tribofilm formation and surface deformation. Quantitative analysis of surface deformation was performed by measuring the geometrically necessary dislocation (GND) density mapped using precession electron diffraction (PED). A clear correlation between wear rate and surface strain was established. However, the relationship between tribofilm formation, surface strain and the applied potential was more complex.

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