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Invited talk

Tribocorrosion of biomedical implants

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The increase in life expectancy has meant that more and more elderly people require substitution of degraded natural joints with implants. Every year nearly 2 millions patients worldwide require a hip joint replacement. In US one elderly person over seven bears a knee or hip implant. Thus joint implants have entered in the daily lives of older people and an increasing number of younger patients. The primary function of hip and knee implants is of tribological nature and consists in ensuring the mobility of the articulation while carrying the person weight.

Not surprisingly, tribologists have been involved in the R&D on hip and knee joints that, despite their clinical success with survival rate in excess of 90% after 17 years, still require improvements and understanding of the responsible degradation mechanisms. Tribology related research was focussed in the past in establishing solid test protocols, designing appropriate material and surface combinations and assessing and quantifying the lubrication regime. Understanding the complex physical and chemical interactions between contacting surfaces and the surrounding body fluids constitutes nowadays a new research line in the tribology of artificial joints. In particular, the role of interfacial reactions in the degradation of joint and junction surfaces by combined wear and corrosion (tribocorrosion) is investigated by a number of laboratories.

In this talk we will discuss recent progress in the field of tribocorrosion of biomedical implants including mechanistic multiphysics models and their applicability to predict in-vivo hip joint wear rates. Further, the failure of large head MoM hip joints will be retrospectively analysed in an attempt to identify what went wrong, in particular in research and knowledge transmission.