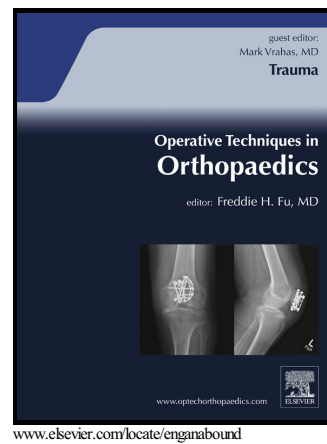


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Why We Need Coating Technologies for Hip Replacement Systems, and the Importance of Testing them in Vitro

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Why we need coating technologies for hip replacement systems, and the importance of testing them in vitro

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Abstract

The rationale behind novel surface engineering and coating technologies for implant articular surfaces are described especially for the significant number of metal-sensitive Total Hip Replacement (THR) patients. We list the important coating characteristics, and emphasize adhesion as the most challenging. We report on two large scale experimental hip wear simulator studies we conducted on samples of two such coating technologies implemented by external experts in their respective fields. One was a titanium nitride ceramic coating on a metal-on-metal THR which aimed at wear reduction and a barrier against metal ion diffusion. The other was a nano-crystalline homo-metallic surface treatment where same element metals are vapor-deposited in a novel ion-beam-assisted deposition (IBAD) process onto CoCr alloy femoral heads in CoCr metal-on-UHMWPE hips. The gradual reduction in crystal size towards the surface into nano size aimed at increasing hardness and reducing wear. Both test series were conducted on an AMTI hip simulator for 5 Million cycles under the 14242-1 ISO standard, simulating walking gait, without any deliberate edge-loading or harsh conditions, and using uncoated specimens of identical design and materials as controls in each test. Both tests

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