

## MORPHOLOGY AND ADHESION OF SILICON NITRIDE COATINGS UPON SOAKING IN FETAL BOVINE SERUM

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**Summary:** Total hip joint replacements are considered successful in providing patients with close-to-normal lives; however, revision surgeries still represent an individual and socioeconomic burden due to wear and failure of the implants, which occurs at a rate of 3-10% at 10 years. Therefore, efforts are being made to increase the lifespan of artificial prostheses. Because of the impossibility to avoid wear debris, functional silicon nitride coatings are being developed due their low wearing, particle solubility and good biological response. However, a compromise needs to be found between coating reactivity and durability.

A HIPIMS process was used to sputter a CrN interlayer followed by a SiNx top layer using 1- and 3-fold rotation in an industrial deposition system (CemeCon AG, Würselen, Germany). In order to measure the adhesion of the coatings to the cobalt-chromium-molybdenum substrates a scratch test was used, consisting of generating a scratch with a Rockwell C diamond stylus, at an increasing load from 0 to 100 N, at a displacement rate of 6mm/min. The samples were immersed in 25% fetal bovine serum solution to mimic synovial joint fluid and scratched after 0, 1, 3, 6 weeks periods in this solution. The cross-section of the coatings was assessed through Focused Ion Beam at 30kV for milling and 5kV for secondary electron imaging of the surface.

The coatings demonstrated a high nitrogen content, previously shown to be beneficial in terms of low dissolution rates. The deposition conditions and coating morphology were found to have an effect on the dissolution rate and thereby also the spallation failure of the coatings. These results are informative for the further development of these coatings into parts of functional 3D implants.

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