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Time-evolution studies of thermal sprayed hydroxyapatite coatings

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Abstract content (Max 300 words)
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Coatings of Hydroxyapatite (HAp, $\text{Ca}_5(\text{PO}_4)_3\text{OH}$), widely used in reconstructive surgery and dental implants, were characterized utilising both conventional and hard X-rays. The samples investigated were prepared by thermal spraying technique deposited under atmospheric conditions. Subsequent to spraying, the samples were incubated in simulated body fluid for periods of time ranging from 1 day to 56 days. The samples were investigated for phase composition and residual stress at time t_1 , after the incubation. The near-surface results of the as-sprayed and incubated samples show that within the probing depth, the coating experienced tensile residual stresses; relaxing with incubation time. The two major chemical phases, HAp and metastable tetracalcium phosphate (TTCP, $\text{Ca}_4(\text{PO}_4)_2$), show an opposite trend, with majority of changes taking place within the first 28 days before levelling off at longer incubation period. Through-thickness results of the as-sprayed sample showed HAp decreasing with depth while TTCP showed an opposite trend. Residual stress varied with depth from compressive to tensile with the neutral axis approximately midpoint below the surface, reaching maxima around the interface region. Further characterisation was carried out on samples from the same batch, left sealed in plastics for approximately 8 years.

In this talk, depth-resolved investigation results of residual stress, phase composition and crystallinity of the sample left sealed will be presented. A comparison of the results obtained from measurements carried out at arbitrary time t after incubation and 8 years later will be made. In addition, results of morphological examinations of the coating surface will also be presented.

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