Seminar

Institute for Plasma Research

Title : Testing & optimization of plasma treated Ti6Al4V for the development of hip femur head and dental crown

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Date : 18th October 2019 (Friday)

Time : 03.30 PM

Venue : Seminar Hall, IPR

Abstract:

Aim of the present work is to prove that the advance surface engineering techniques e.g. plasma nitriding is suitable for development of cheaper biomaterials for societal benefits. We have initiated a work regarding the development of hip joint femur head and dental crown. Metals are allergic to the patient, although it is rare to be allergic to titanium. Titanium femur heads and crowns are usually made of titanium alloy which is a combination of a few metals including small amounts of aluminium, vanadium and nickel. Few people have been allergic to such Ti6Al4V alloy, due to the small amount of vanadium found in Ti6Al4V alloy.

Alumina and zirconia are recently used in order to minimize the risk of allergies. But they are prone to fracture due to their ceramic nature, which results in the implant and crown failure. Thus, we have tried to modify the surface of hip femur head and dental crown using embedded titanium nitride layer. Thus, vanadium release can be reduced, thereby reducing the risk of allergies, along with fracture toughness, and higher biocompatibility due to titanium nitride phase formation.

Plasma nitriding has been carried out at four different conditions in order to find out the optimized one. Initial result of the structural and tribological characterization showed that the performance of plasma nitrided Ti6Al4V (TiPN) far more superior as compared to the bare Ti6Al4V (Ti). The results of *biocompatibility* and *cyclic fatigue response* clearly reveal that the performance of TiPN femur head (FH) is better than Ti FH. Design of dental crown is under the line of preparation though CAD and FEM based modelling. Further to the scope of the 'Validation Project', additional performance tests and preclinical trial has to be carried out to generate a data set, which could validate the improved performance of the plasma nitrided dental crown prototype samples.