

**OP 302**

## Additive Manufacturing of Novel CoCrMoFe Alloy for Dental and Maxillofacial Applications

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The design of prostheses for maxillo-facial restoration requires a careful selection of materials with desirable biocompatible properties. CoCrMo alloys are preferred for dental applications due to their excellent mechanical and tribological properties. However, toxicity and cost due to the high concentration of cobalt is a major concern. In the present work, using the Calphad approach, an attempt is made to invent a novel low-cost CoCrMo-Fe alloy composition. This alloy composition was designed with a considerable reduction in the concentration of cobalt by the addition of iron which can also be printed by the laser powder-bed fusion (LPBF) additive manufacturing process.

Optimum printing parameters were identified using a grid-search approach for producing parts with minimal defects by the LPBF process. Mechanical properties of as-printed and heat-treated (porcelain-fused-metal firing cycles) CoCrMo-Fe alloy samples were analysed and compared to medical grade CoCrMo alloy as a function of build orientations. The corrosion behaviour was investigated by performing immersion and electrochemical tests using artificial saliva as the physiological media. Results showed that the mechanical behaviour and corrosion resistance have significantly improved by Fe addition in medical-grade CoCrMo alloys. The printed CoCrMo-Fe alloy can be considered as a potential low-cost alternative to commercial medical-grade CoCrMo alloys.