

Investigation of the Al₂O₃/Ti joint microstructure, brazed with Ti-Zr-Co filler metal

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The aim of this work is microstructure study, elemental analysis and corrosion test of alumina/titanium joint brazed with Ti-Zr-Co filler metal in order to propose a new design of femoral head with increased reliability for hip joint endoprosthesis.

Currently, hip joint endoprotheses are widely used for people with diseases of the musculoskeletal system. The most common endoprotheses – with a ceramic-ceramic friction pair. However, their usage for people with an active lifestyle is not widely distributed due to the fragility of ceramic femoral head and their possible destruction under shock loads. In this work, the new design of the femoral head with brazed metal inlet proposed. With the method of finite element analysis, it is shown, that stress in femoral head with metal inlet are lower in compare with standard design head for hip joint endoprotheses.

Based on the analysis of literature data, a biocompatible Ti-Zr-Co filler metal was developed for brazing alumina ceramics with titanium. The microstructure of Ti/Al₂O₃ brazed joints has been studied, as well as EDX microanalysis has been performed. Corrosion tests of filler metal strip and fragment of brazed joint were carried out for 680 hours, at a temperature of 38 °C, in an aqueous solution of sodium chloride (0.9%), potassium chloride (0.03%) and calcium chloride (0.03%). The absence of filler metal and brazed joint interaction with the corrosive environment is shown.

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