

Medical Implants and Devices: Numerical modeling of galvanic corrosion problems of dental implants screws and nuts via BEM

*Dimitrios T. Kalovelonis, Department of Mechanical Engineering and Aeronautics,
University of Patras, GR-26500, Patras, Greece. d.kalovelonis@upnet.gr*

Abstract

Corrosion is of great concern particularly when a metallic implant is placed in the hostile electrolytic environment of the human body. The implants face severe corrosion environment which includes blood and other constituents of the body fluids. The aqueous medium in the human body consists of various anions such as chloride, and dissolved oxygen. Changes in pH values also influence corrosion. Although, the pH value of the human body is normally maintained at 7, this value changes from 3 to 9 due to several causes such as accidents, diseases, infections, and other factors. Oral implants, screws and nuts are either different grades of stainless steels alloys, either stainless steel and titanium alloys, or stainless steel and cobalt–chromium–molybdenum alloys galvanic couples. The boundary element method (BEM) is ideal for solving galvanic corrosion problems. In the present work the effect of pH, temperature, and electrical conductivity on the galvanic corrosion of oral implants screws and nuts is studied, using BEM.