**Supplementary Material**

**Corrosion, stress corrosion cracking and corrosion fatigue behavior of magnesium alloy bioimplants**

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**1 Corrosion testing methods**

Popular corrosion testing methods such as immersion test (ASTM NACE / ASTMG31-12a, 2012), potentiodynamic polarization (ASTM G59-97, 2014), electrochemical impedance spectroscopy (EIS) (ASTM G106-89, 2015), and cyclic potentiodynamic polarization test (ASTM F2129-19a, 2019) can be conducted to evaluate the *in-vitro* corrosion performance of the biomaterials. ASTM F746-04 (2014) standard is used to evaluate the pitting or crevice resistance of metallic implants. ASTM F897-02 (2002) is the standard to measure the fretting corrosion of osteosynthesis plates and screws. A list of various corrosion testing media such as simulated body fluid (SBF), Hank’s balanced salt solution (HBSS), modified eagle medium (MEM) etc are given in section 2.3 of the review article. The testing temperature should be maintained at 37$℃$ which is the body temperature of normal human.

**2 Stress corrosion cracking and corrosion fatigue tests**

Slow strain rate testing (SSRT) (ASTM G129-00, 2013) is used to evaluate the stress corrosion cracking (SCC) resistance of metallic implants in both air and physiological environment. Circumferential notch tensile (CNT) (Choudhary and Singh Raman, 2012) testing is used to determine the threshold stress intensity factor for SCC and stress corrosion crack growth rate. ASTM F1801-97 (2014) covers the standard practice for performing corrosion fatigue tests of axially loaded fatigue specimen in air and in saline solution at 37$℃$. This standard can be extended to test other modes of fatigue loading such as bending and torsion in metallic implants.

**References**

ASTM F1801-97, Standard Practice for Corrosion Fatigue Testing of Metallic Implant Materials. (2014) ASTM International, West Conshohocken, PA.

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ASTM F746-04, Standard Test Method for Pitting or Crevice Corrosion of Metallic Surgical Implant Materials. (2014) ASTM International, West Conshohocken, PA.

ASTM F897-02, Standard Test Method for Measuring Fretting Corrosion of Osteosynthesis Plates and Screws. (2002) ASTM International, West Conshohocken, PA

ASTM G106-89, Standard Practice for Verification of Algorithm and Equipment for Electrochemical Impedance Measurements. (2015) ASTM International, West Conshohocken, PA.

ASTM G129-00, Standard Practice for Slow Strain Rate Testing to Evaluate the Susceptibility of Metallic Materials to Environmentally Assisted Cracking. (2013) ASTM International, West Conshohocken, PA.

ASTM G59-97, Standard Test Method for Conducting Potentiodynamic Polarization Resistance Measurements. (2014) ASTM International, West Conshohocken, PA.

ASTM NACE / ASTMG31-12a, Standard Guide for Laboratory Immersion Corrosion Testing of Metals. (2012) ASTM International, West Conshohocken, PA.

Choudhary, L. and Singh Raman, R. K. (2012). Magnesium alloys as body implants: fracture mechanism under dynamic and static loadings in a physiological environment. Acta Biomaterialia 8: 916–923.