ORDRE DES INGÉNIEURS DU QUÉBEC

SESSION OF APRIL 2016

All documentation permitted
Calculators: models only authorized
Duration of examination: 3 hours
"Answer the following five questions on 50 points, distributed in an equal way"

14-MT-A7 CORROSION AND OXIDATION

Question 1 (*10 points*)

a) Schematize the curve of Anodic polarization of stainless steel as an example in an environment, where passivation is observable. Explain the critical current of passivation and the criteria for a good passivation. (*5 points*)

b) Explain the role of sodium sulfite (Na_2SO_3) and hydrazine (NH_2NH_2) as corrosion inhibitor and schematize the influence of this inhibitor on the diagram of Evans in the presence and absence of the inhibitor. (*5 points*)

Question 2 (*10 points*)

a) Explain and give examples of the required conditions (Material and environment) which can contribute to a galvanic localized corrosion form rather than a uniform attack of the anode in a corrosion cell. (*5 points*)

b) Explain the terms and the harmful effects of corrosion influenced by microorganisms (Microbiological Influenced Corrosion). (5 *points*)

Question 3 (*10 points*)

(a) Explain the corrosion due to wet materials (Poultice Corrosion) which leads to Localized Crevice Corrosion or pitting formation. (*5 points*)

(b) Explain the phenomenon of Impingement (Hammering) of the Corrosion-Erosion Form and comment on the sum of different damages, caused with this type of corrosion. (*5 points*)

Question 4 (*10 points*)

(a) Explain and give reasons: «Sulfidation attack at high temperatures of stainless steel type 310 with sulfur gas-containing environments is more serious than the effect of the oxidation with oxygen» (*4 points***)**

b) Explain the difference between the Fatigue Corrosion and Stress Corrosion Cracking concerning the corrosive medium, required stresses, and the morphology of crack propagation. *(6 points*)

Question 5 (*10 points*)

a) Explain the effects of stray currents encountered in Cathodic Protection with impressed electric current and give an example of the preventive means for this type of corrosion. Press your answer with explicative schemas. (*5 points*)

b) "Organic coatings, depending on the additives they contain, protect metal surfaces after some main mechanisms", name these mechanisms, explain them and give some examples. (*5 points*)