Joumnal of Applied Sciences 6 (6): 1338-1342, 2006

ISSN 1812-5654

Corrosion of Low Carbon Steel Influenced by the Presence of Iron-oxidizing Bacteria *(Leptothrix discophora)*

'Rim-rukeh Akpofure, 'Ikhifa O. Grace, 'E.J. Konyeme and 'Okokoyo A.Peter

'Department of Integrated Science,Department of Chemistry,

College of Education, P.M.B.2090, Agbor, Delta State, Nigeria

Abstract: Corrosion of low carbon steel influenced by the presence of Leptothrix *discophora* (Iron bacteria)has been studied, using the weight loss technique. At an exposure time (weeks) of 4, 6, 8, 10 and 12the corresponding calculated corrosion rates in mpy in the presence *of Leptothrix discophora* were 1.36,1.46,1.69, 1.94 and 2.09 while the corrosion rates in the absence of the microorganism were 0.65,0.69,0.84,0.91 and 0.97,respectively. Visual inspection of the coupon retrieved after 12 weeks of the test period showed the presence of mosaic deposits of rusty materials on its surface.Linearity between the log of weight-loss and period of exposure showed that the reaction was a first order reaction. The adsorption of rusty materials on the surface of the coupons in batch reactor 1 was due to physiosorption (physical adsorption).

Key words: Biocorrosion,Leptothrix discophora,first order reaction, physiosorption

INTRODUCTION

System failures resulting from corrosion influenced by microorganisms have been widely reported in petrochemical and gas industry (Ibe, 1989, Abu, 1992),nuclear power stations, (Videla, 1996), geothermal plants (Pryfogle, 2002), fire protection systems (Mittelman, 2003) and water treatment plants (Characklis and Marshall, 1990). This type of corrosion is known as biocorrosion or microbiologically influenced corrosion (MIC) or microbial corrosion and is defined as an electrochemical process where the participation of microorgamisms is able to initiate,facilitate or accelerate the corrosion reaction without changing its electrochemical nature (Videla, 1996).

Corrosion of metals influenced by microorganisms is due to its ability to alter the kinetics of the interaction.The presence of microorganisms can increase corrosion rates by 1000-100,000 times than in their absence (Costello, 1969). MIC has the potential to produce extraordinary corrosion rates of 25 miles per year (mpy)and more, which is sufficient to destroy a piping system in just a few years (Corrview, 2004).

A mumber of microorganisms have been implicated in the corrosion of metals. For oxample, sulphate reduoing bactoria (Desulfovibrio sp.); sulphide oxidizing bacteria (Thiobacillus ferroxidarm); iron bacteria (Gallionella sp.);nitrogen utilizing bacteria (Pseudomanas sp.) and filamentous fungi (Cladosporium resinae).However,of all the species of microorganisms implicated in the corrosion of metals,te most notorious, most studied and most insidious is the sulphate reducing bacteria (Abu, 1992).

The petroleum and process industry in Nigeria has over the years experienced a mumber of corrosion problems (Ajayi, 2003).Most of these corrosion problems have been attributed to abiotic factors. In particlar,knowledge of the roles play by microorganisms in the corrosion of metals in Nigeria is still lacking. The objectives of this study were to determine the effects of ironoxidizing bacteria *(Leptothrix* discophora) on the corrosion of low carbon steel under aerobic conditions.The result of the study will contribute to this increasing wealth of knowledge concerning the role of microorganisms in influencing the rate of corrsion of metal.

MATERIALS AND METHODS

Proparation of corrosion coupons: Sheets **of** low carbon steel (0.1-0.2% of carbon content and density of 7.82 g om' as was reported by the manufacturer) wore obtained from NEK Technical in Port-Harcourt, Nigeria and cold cut to the dimension of 10x5x0.5 cm.Tho cold cut technique was used so as to maintain the integrity of the steel and hence avoid the probable effects of the heat-affectod zone (HAZ)on corrosion. Fach coupon was perforated with a hole of the same diameter at the side to allow the passage of thread.

Correponding Author: Rim-Rukeh Akpofure, Department of Integrated Science, College of Education, P.M.B. 2090,Agbor,Delta State,Nigeria

B