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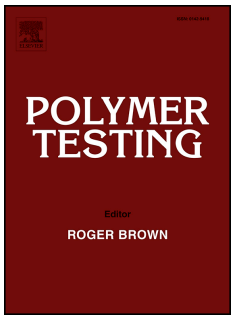

Effect of the addition of calcium carbonate on the barrier behavior of polyamide 11 used in offshore applications by electrochemical impedance analysis

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Material Behaviour

EFFECT OF THE ADDITION OF CALCIUM CARBONATE ON THE BARRIER BEHAVIOR OF POLYAMIDE 11 USED IN OFFSHORE APPLICATIONS BY ELECTROCHEMICAL IMPEDANCE ANALYSIS

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Abstract

In offshore oilfield exploration, flexible pipe technology has gained importance as a convenient and effective way to connect seafloor wellheads to sea level oil platforms. This structure has several layers each one presenting specific functions: polymeric layers – fluid barrier and metal layers – mechanical strength. Polyamide-11 (PA11) was one of the first polymers used for the internal insulation layers in flexible pipes used in offshore oilfield exploitation. The aim of this work is to evaluate the effect of calcium carbonate particle size (nanoparticles – NPCC and microparticles – PCC) on the barrier properties of PA11 matrix, the grade used in the pressure layer of flexible pipes, towards the diffusion of ions and molecules present in crude oil. This evaluation was based on acquisition of Electrochemical Impedance Spectroscopy data, which helps to interpret the metallic corrosion behavior. The results indicated that the PA11/NPCC system formed a better protective corrosion barrier over carbon steel due to its higher polarization resistance when compared to neat PA11 and PA11/PCC composite.

Keywords:

Polyamide 11, calcium carbonate, composites, barrier property, eletrochemical impedance spectroscopy