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Improvement in Nano-hardness and Corrosion Resistance of of XC48 Samples by Plasma Immersion Ion Implantation

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Abstract : In this work, Nitrogen Plasma Immersion Ion Implantation (PIII) treatment of (XC48) Carbon steel was performed in a vacuum chamber with an inductive RF source (l3.56 MHz) at low pressure in order to investigate the influence of the process conditions on the corrosion properties of this studied material. The X-rays diffraction analysis revealed the presence of several nitride phases (Fe3N and FeN) formed onto implanted samples. The mechanical characterization of the processed samples showed an increase of 450 % in the nanohardness.A low corrosion rate is obtained denoting an improvement in the corrosion resistance behavior. These results are particularly interesting since they were obtained for relatively low bias voltages and processing time.

Keywords : Plasma nitriding, Low Carbon Steel, Nanohardness, corrosion resistance, Negative DC bias voltage