Brine resource is rich in China, but its exploitation has been a problem. Hypersaline brine will corrode equipment and materials seriously during the brine exploitation and transportation. The corrosion problem can cause great economic loss and influence the efficient exploitation of the brine. Therefore, study anti-corrosion coatings to prevent the metal loss and reduce the energy consumption and ensure continuous mining brine is very important and meaningful. This study prepared Ni-W-P alloys by electroless deposition on the N80 steel at 90°C using a solution (pH = 9.0) containing nickel sulphate (35 g/L), sodium tungstate (40 g/L), sodium hypophosphite (25 g/L), sodium citrate (100 g/L), ammoniumsulfate (30 g/L), lacticacid (5 mL/L), sodium dodecyl sulfate (0.1 g/L). The coating microstructure and grain type was studied using scanning electron microscopy (SEM), energy dispersive X-ray analysis (EDX) and X-ray diffraction (XRD) techniques. The corrosion behavior of Ni-W-P coatings were investigated using polarization curve and weight loss method in the original brine with salinity of 265g/L at temperature of 25°C and 90°C, respectively. The surface morphology of Ni-W-P coatings after corrosion was studied by SEM, and the chemical composition of the corrosion layer was analysed by X-ray photoelectron spectroscopy (XPS). The results showed that the coating was amorphous, good integrity, smooth compact and no impurities. The correlation of weight loss of coupons with time showed that the coating was 10 times the corrosion resistance of the N80 steel in hypersaline brine (M=265g/L) at 90°C. Polarization curves of the coatings showed that corrosion current $i_{corr}$ 1.571μA of the coatings was much lower than that $i_{corr}$ 31.95μA of the carbon steel, and $E_{corr}$ -0.42 V of the coating is higher than the -0.61 V of the carbon steel. This result revealed that the coatings on the carbon steel have better corrosion resistance than the naked carbon steel. The SEM micrographs of the N80 steel and Ni-W-P coating after corrosion showed that, severe intergranular corrosion appeared in carbon steel,
while none intergranular corrosion happened in Ni-W-P coating. Ni-W-P coating exhibited superior corrosion resistance, which could be attributed to coating elements, refined microstructure and NiO and WO3 in the corrosion scale. This study confirmed that the Ni-W-P coating can be applied for corrosion protection in salty environment and catches a higher efficiency in corrosion protecting compared to the corrosion inhibitor as well as other coating technology.

**Key words:** Ni-W-P coating, corrosion resistance, hypersaline water.

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