Abstract

Current search works on the preparation of different layers of coating to protect oil pipeline from environmental factors, especially from the corrosive atmosphere and study the adhesion strength of these layers. Thus, samples were taken from the pipelines of the Midland Refineries company. After the pipes were cleaned up well, Samples were chopped (low carbon steel) according to international standards for each test. And then, the coatings processes were done in three stages as follows:

The first stage was concerned with sherardizing process which was done at 400°C for different treatment times (15,30,60,120,240 min), and a study of mechanical properties, corrosion resistance, surface roughness and morphological properties was performed.

The second stage was done for as received and sherardizing surface of low carbon steel. It included with coating by (UP: NBR and UP: BR) polymers blend at different ratios of BR or NBR in the blends (5, 10 and 15 wt%). After coating the samples with these polymers blend, a study was conducted, which represented by adhesion strength, flexural strength, maximum shear stress, hardness and morphological properties for polymer blend.

The third stage was concerned with coating by conducting polymer polypyrrole (PPY), the coatings were carried out on low carbon steel (as received) and on sherardized samples.

- Sherardizing coating was achieved by heating low carbon steel samples in containers with (50%zinc: 50% sand) mixture. Then, these samples were put in furnace at 400°C for different times, and finally cooled to room temperature by switching off the furnace. The following results were found: Hardness Results of sherardizing coating low carbon steel are increased as the treatment time of sherardizing process are increased.

The coating thickness of sherardizing process increase with the increase of treatment time. Microstructure characterization of sherardizing coating does not show a distinct crystal structure. Improved corrosion resistance of low carbon steel by sherardizing coating. And, the corrosion rate of sherardizing coating treatment in four hours is lower than the other treatment time (0,15,30,60,120 m) .

- Coating by polymer blend (UP: NBR and UP: BR) was performed by using different ratios of NBR and BR (5, 10, 15%wt) resulted in the following findings: Regarding the Shore D hardness for both types of polymer blends (UP :NBR, UP :BR) , was shown that the hardness values are decreased with increasing the rubber content (BR or NBR) in polymer blend layer coating.

The result showed that the polymers blend (UP : NBR) coating layer has higher flexural strength and maximum shear stress than (UP : BR). And, the addition of rubber material (BR or NBR) to the polymer blend coating layer increases the flexural strength and maximum shear stress values of sherardizing low alloy steel. Except the samples coated with the polymer blend (UP : BR) layer , the flexural strength and maximum shear stress values reached to maximum values at BR 10%wt and then sharply decreased with increased BR ratio to 15%wt. For the adhesion force as a function of the surface roughness of (UP: NBR) and (UP: BR) blends, it was noted that the adhesion force increases with surface roughness for all coating polymer blends, And the adhesion force is decreased with the increased BR or NBR content in the blend. As well, the coating layer prepared from 100%wt unsaturated polyester resin has a higher adhesion force compared to polymer blend coating.

- Coating by conductor polymer (PPY) resulted the following result:

The corrosion current density i_{corr} for the as received low carbon steel sample is found to be (32.9 $\mu A/cm^2$) and with polymer PPY coating layer is (0.206 $\mu A/cm^2$). And for the sample coated with sherardizing coat, only i_{corr} equals to (2.07 $\mu A/cm^2$). while the samples incorporated with sherardized coat and PPY is found to be 0.107 $\mu A/cm^2$, that means a reduction in the corrosion rate.