

**INTERFACIAL INHIBITIVE EFFECT OF
POLYANILINE METANILIC ACID CO-POLYMER
ON MILD STEEL FOR ACID RAIN SOLUTION**

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INTRODUCTION:

Intrinsically conducting polymers have been identical as novel corrosion preventive coating for metals [1]. Several reports have since then appeared [2] and provided the efficacy of conducting polymer as a possible protective material especially for steel. It was believed that the conducting polymers passivate metal by forming a protective oxide on the surface of the metal thereby reducing the corrosion. This approach has been tested and verified recently to mostly for conventional corrosion inducing solutions. Besides protective coating, the conducting polymer can also be used as an inhibitor to the corrosion inducing solution. Among several such solutions, Acid rain is an upcoming one, which needs containment. In this paper, we report for the first time the use of a soluble conducting polymer as a potential corrosion inhibitor for a laboratory formulated acid rain solution.

EXPERIMENTAL:

Poly (aniline- co- metanilic) acid was prepared as per the reported procedure [3] and its soluble form was used as inhibitor. The acid rain solution was formulated from the known source [4]. A three-electrode cell arrangement was used in which the mild steel (1cm²) was a working electrode, a Pt foil as counter electrode along with Ag/Agcl reference electrode. The acid rain solution used was made 20 times concentrated from the natural composition. The pH value of natural composition was measured to be between 5-6. The pH value of 2-3 was maintained by adding drops of sulphuric acid. Polarization and AC impedance measurements were carried out using BAS 100B electrochemical analyzer for a fresh piece of mild steel at various concentrations of polymer solution, which was added as inhibitor in acid rain solution.

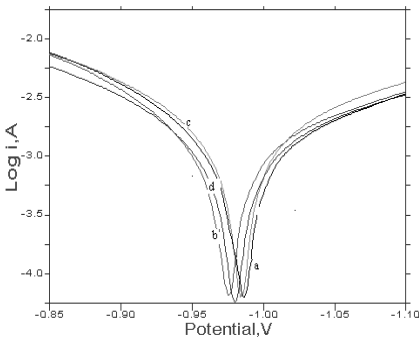
RESULTS AND DISCUSSION:

Fig.1 shows polarization curves recorded for the mild steel both in inhibitor free as well as inhibitor added solution. The anodic and cathodic curves have been found to be well defined and the use of conducting polymer solution has been found to shift the E_{corr} to a positive value. This indicates that the inhibitor in acid rain solution follows the redox reaction induced passivation effect. Thus the redox feature of Poly (aniline – co – metanilic) acid serves as a new inhibitor for acid rain composition with respect to mild steel. Table 1 shows the extracted values of E_{corr} and I_{corr} from these measurements and also the inhibiting efficiency of various concentration of polymer. It is to be noted that lower concentration of

polymer (i.e.) 25ppm is quite sufficient to achieve passivation of the mild steel surface. Fig.2 shows the trend of the inhibiting efficiency of the polymer over its various concentrations ranges. It is seen that the inhibiting efficiency saturates at the level 75 ppm of polymer solution.

TABLE 1:

Concentration (ppm)	E _{corr} (mV)	I _{corr} (μA)	R _{corr} (MPY)	Inhibiting Efficiency (%η)
Blank	-986	78.34	36.15	—
25	-976	69.02	31.85	11.89
50	-983	65.16	30.06	16.82
75	-980	57.68	26.61	26.37



a) Bare, b) 25ppm, c) 50ppm, d) 75ppm

Figure 1

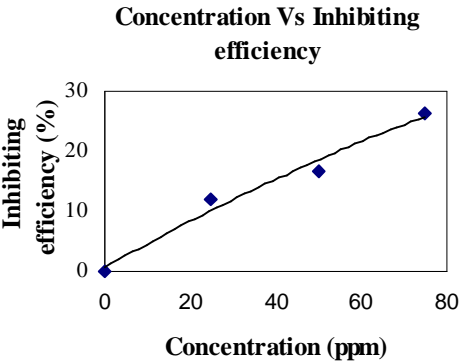


Figure 2

CONCLUSION:

Thus, it is shown for the first time that the soluble conducting polymer in solution form can be used as an effective inhibitor in acid rain solution.

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