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NOTES

Effect of Concentration of Electrolyte in Polymer Coatings Through Post-Polymerization of Acrylamide

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We present here a preliminary report on effect of change in concentration of electrolyte on coating-weight of polymer during post-polymerization.

If electric current is passed through an aqueous solution of zinc chloride containing acrylamide until the solution turns turbid, a good yield of polymer is coated on cathode[1–4]. The polymer continued to be coated at cathode even after switching off the current provided the system is allowed to stand undisturbed[5–7]. A preliminary report on effect of change in concentration of electrolyte on coating-weight of post-polymerization is presented here.

The experimental arrangement is more or less the same as described in earlier paper[8]. The aqueous solution containing acrylamide and zinc chloride as an electrolyte is electrolysed by passing current at 5 volts for one minute between aluminium anode and steel cathode. The current is then switched off and the system is left undisturbed for 24 hrs. The polyacrylamide deposited at cathode. The effect of concentration of $ZnCl_2$ is shown in Table 1, from which it is concluded that coating weight of polymer increased with the increase of concentration of zinc chloride. On the basis of the I.R., N.M.R. spectra and elemental analysis of the coated material at cathode, it is confirmed that the polymer is coated at cathode. In the I.R. spectrum of the polymer the absorption band based on terminal methylene at 920 cm^{-1} and vinyl group streching at 1645 cm^{-1} were absent. It gave NH and CO bond stretching vibration at 3300 cm^{-1} and 1630 cm^{-1} respectively. In the N.M.R. spectrum of the polymer sample the methylene proton appears as broad doublet at 2.25 δ and methyne proton as complex triplet at 4.0 δ. The proton attached to amide nitrogen appears at 6.5 δ.

The $[\eta]$ values however change very slightly with the progress of post polymerization which illustrates that the termination takes place by the transfer with monomer creating a new active center. These polymer radicals produced now can re-combine to form a crosslinked polymer or

TABLE 1

THICKNES OF POLYACRYLAMIDE COATING FORMED ON STAINLESS STEEL CATHODE BY POST-POLYMERIZATION OF ACRYLAMIDE-ZINC CHLORIDE-WATER SOLUTION THROUGH CURRENT PASSED AT 5V (D.C.) FOR ONE MINUTE AS A FUNCTION OF ELECTROLYTE CONCENTRATION ACRYLAMIDE (1.96 M) = 7.0 gms.

Concentration of Electrolyte (zinc chloride)	Coating weight during post-polymerization at 24 hours (gm/cm²)
0.07 M	0.28
0.15 M	0.36
0.25 M	0.69
0.30 M	0.76

interact with electrodes to form the polymer layer bonded to the electrode surface.

The present work reports for the first time, a highly unconventional technique of polymer film coatings on electrodes through post-polymerization. Minimum expenditure of energy is needed for coatings of electrodes in the present technique.

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REFERENCES

1. Encyclopedia of Polymer Science and Engineering, Vol. 5, John Wiley and Sons, New York, p. 587 (1986).
2. B.K. Garg, R.A.V. Raff and R.V. Subramanian, *J. Appl. Polym. Sci.*, **22**, 65 (1978)
3. F. S. Teng, R. Mahalingam, R. V. Subramanian and R.A.V. Raff, *J. Electrochem. Soc.*, **124**, 995 (1977).
4. R. V. Subramanian and Jakubowski, *J. Polym. Engg. and Sci.*, **18**, 590 (1978).
5. S. R. Palit, *J. Polym. Sci.*, (C), **31**, 241, (1970).
6. A. K. Sarkar and S. R. Palit, *J, Polym. Sci. Polym. Chem. Ed.*, **18**, 691 (1980).
7. A. K. Sarkar and S. R. Palit, *J. Indian Chem. Soc.*, **54**, 748 (1977).
8. R. J. Shukla and A. K. Sinha, *Asian J. Chem.*, **5**, 150 (1993).

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