

water (1:1:1) and (4) phenol : water (3:1) as solvents and various specific spraying reagents<sup>1,2-12</sup>. Butanol-acetic acid-water in combination with pyridine-water/butanol-pyridine-water/phenol-water were used as solvents for developing two dimensional chromatograms. For quantitative determinations, ninhydrin colours of individual amino acids of the two dimensionally developed chromatogram were estimated photometrically<sup>1,6</sup> at 570 nm using a Bausch and Lomb Spectronic-20-Colorimeter. The results are given in Table 2.

A perusal of tables 1 & 2 revealed that the seeds of *Cucurbita pepo* and *Cucumis melo* are rich both in calorie and protein contents. Their proteins are rich in all essential amino acids particularly lysine, (phenylalanine + tyrosine), threonine, valine, (leucine and isoleucine) and (methionine + cystine) except tryptophane.

#### Acknowledgement

The authors express thanks to Shri V. V. Sarwate, Director, Technical Education, Madhya Pradesh, Bhopal; Shri R. A. Deshpande, Principal and Dr. V. G. Vaidya, Professor of Chemistry, Government College of Engineering and Technology, Raipur, for providing facilities. The authors are grateful to M/S B. Merck Co; Darmstadt, Germany for supply of cellulose TLC material as free gift.

#### References

1. K. R. KIRTIKAR and B. D. BASU; *Indian Medicinal Plants*; Vol-II, p-1156, 1140.
2. A. L. WINTON and K. B. WINTON; *The Analysis of Food*; Chapman and Hall Ltd; London.
3. A.O.A.C. *Methods of Analysis*, Association of Official Agri. Chem; Washington, 4, D.C, 1960.
4. S. S. JOSHI and S. S. NIGAM, *Curr. Sci.*, 1976, 45, 450.
5. W. MATTHIAS; *Naturwissenschaften*, 1954, 41, 17.
6. K. V. GIRI; *J. Ind. Inst. Sci.*, 1953, 35 (2), 149.
7. K. V. GIRI and N. A. N. RAO, *J. Ind. Inst. Sci.*, 1953, 35(4), 343.
8. A. P. J. MARTIN; *Ann. Rev. Biochem.*, 1950, 19, 517.
9. S. S. JOSHI; Ph. D. Thesis, Ravishankar University, 1974, 75-84.
10. P. WOLLENWEBER; *J. Chromatog.*, 1968, 33, 175; 162, 9, 369.
11. E. VON ARX and R. NEHER; *J. Chromatog.*, 1963, 12, 329.
12. D. MUTING; *Naturwissenschaften*, 1952, 39, 303.
13. S. S. SAKAGUCHI; *J. Biochem.*, (Tokyo), 1925, 5, 25.
14. A. SAIFER and I. ORESKES; *Science*, 1954, 119, 124.
15. J. B. JEPSON and I. SMITH; *Nature*; 1953, 172, 1100.
16. C. E. DENT; *Biochem. J.*, 1947, 41, 240; 1950, 47, 223.

### Electroinitiated Post-polymerization of Methylmethacrylate using Sugar plus Acid as Supporting Electrolyte

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Manuscript received 24 September 1976,  
accepted 17 March 1977

IF electric current is passed through a solution of sodium acetate containing methylmethacrylate (MMA) until the solution turns faintly hazy, a good yield of polymer can be obtained even after switching off the current at this stage, provided the system is allowed to stand undisturbed for a few hours<sup>1</sup>. This is termed Post-polymerization. Not many electrolytes are known to be efficient post-polymerization initiators and just a handful have been lately discovered<sup>2</sup>.

We present here a preliminary report of a few binary initiators of anodic post-polymerization of methyl methacrylate, the individual components having no such power. Some inorganic acids, however, do have some power of cathodic post-polymerization under certain conditions<sup>3</sup>, and dextrose has been used as a component of a redox initiator<sup>4,5</sup>.

#### Results and Discussion

The experimental arrangement is more or less the same as described by Palit<sup>1</sup>. The electrolyte used is a solution of HCl containing a sugar. The solution is electrolysed to produce a faint haziness; the current is then switched off and the system is left undisturbed for a day or so after which the post-polymer is collected. The initial haziness has to be just optimum; if it is too strong there is a tendency towards gelation during post-polymerization, more so for cane sugar than for glucose.

Effect of concentration of dextrose and HCl is shown in Table 1 from which it is concluded that a

TABLE 1—EFFECT OF ACID AND DEXTROSE CONCENTRATION IN THE ELECTROINITIATED POST-POLYMERIZATION OF METHYL METHACRYLATE USING DEXTROSE/HCl AS ELECTROINITIATOR ELECTROLYTE

[MMA]=1% (v/v), current=1000 mA × 60 mins., Temperature=32.5°C, Post-polymerization time=24 hrs.		
Conc. of dextrose in (M) HCl=0.72 M	Post polymer yield(%)	[ $\eta$ ] at 30°C
0.1	0.75	—
0.2	50.7	—
0.3	58.6	1.12
0.4	55.0	—
0.5	52.6	1.15
0.6	51.5	—
Conc. of HCl in (M) Dextrose=0.3 M		
0.60	36.8	0.95
0.72	58.6	1.12
0.84	63.5	1.28
1.20	73.7	insoluble gel

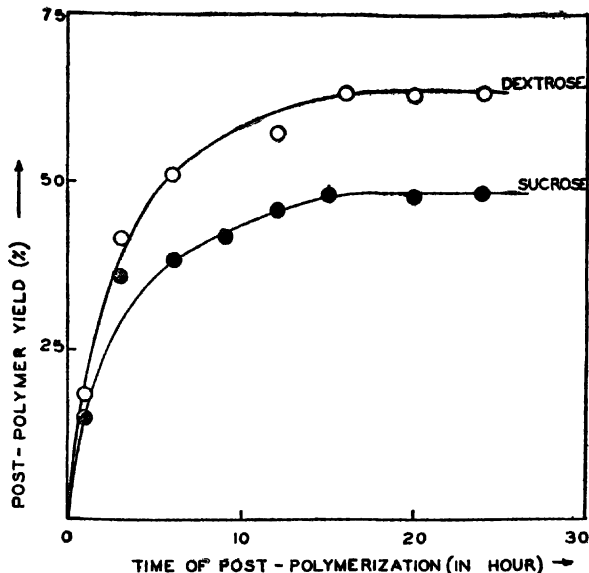


Fig. 1. Time versus per cent yield during Post-polymerization of Methylmethacrylate by Sugar/HCl as supporting electrolyte.

[HCl]=0.72M, [Sugar]=0.3M [MMA]=1%(v/v)  
Current=100 mA × 60 mins. temp.=32.5°.

sugar concentration of about 0.1 to 0.3 is just about the optimum and the minimum acid concentration necessary to produce a high yield is about 0.72 M. The post-polymerization is rather fast during the first few hours as is shown for a typical system in Fig. 1. The  $[\eta]$ -value however does not change much with progress of post-polymerization—a characteristic which is typical of post-polymerization.

Though aqueous redox polymerization is strongly inhibited by traces of dissolved oxygen, post-polymerization is not so sensitive to air, no special precaution being therefore necessary to exclude air in the latter case. So the reported post-polymerization does not involve redox polymerization. However, this is a free radical process as is shown by strong inhibition by hydroquinone. HCl has possibly a dual function, serving as the electrolyte as well as producer of the right pH. The sugar gets oxidised at the anode possibly producing the initiating free radical. It is likely that each monomer swollen oligomeric free radical formed by electro initiation constitutes the isolated loci where post-polymerization takes place. The gelation appears to be due to the presence of sugar. It is likely that some kind of crosslinked polymer is formed due to multiple free radical formation (by oxidation or chain transfer) on the same sugar molecule.

#### References

1. S. R. PALIT, *J. Polymer Sci.*, (C), 1970, No. 31, 241.
2. A. K. SARKAR and S. R. PALIT, unpublished work.
3. N. S. TSVETKOV, *Polymer Sci.*, (USSR), 1962, 3, 570.
4. T. SAKUNA and I. NAKAMURA, Japanese patent, *Chem. Abs.*, 1968, 68, P87860F.
5. M. S. BAIN, *J. Polymer Sci.*, (C), 1972, 123.

#### A Peculiar Current-Increasing Effect of Cellophane Membranes.

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Manuscript received 24 September 1976, accepted  
17 March 1977

**I**N course of our work on non-Faradaic electrolysis<sup>1,2</sup> we made the surprising observation that on interposing a cellophane membrane between the two electrodes, with the purpose of checking inter-electrode diffusion and convective or mechanical mixing, the current showed an increase (+ $\Delta i$ ) instead of the expected decrease.