E2-41: A new furan resin

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An approximately 1:1 mixture of furfuryl alcohol and hydrofuroin, obtained from the electrochemical reduction of furfural, was polymerised using acid catalysts. The properties of the new co- polymer was compared with those of a furfuryl alcohol polymer prepared in a similar manner (Table 1).

The tetrafunctional hydrofuroin would be expected to form a more cross linked structure than furfuryl alcohol. ^{1}HMR studies of the early stages of polymerisation indicated clearly that different structures were generated in the 2 polymers. Detailed analysis of the spectra was not possible without separation of products.

Financial assistance by NARESA (grant number RG/89/C/1 is acknowledged.

Table 1. Properties of a furfuryl alcohol-hydrofuroin copolymer and furfuryl alcohol polymer

Property	*Co-polymer*	*Furfuryl alcohol polymer*	*Comment*
1. Chemical and solvent resistance	Resistant to dilute and concentrated HCl H_2SO_4, NaOH, and to Methanol, hexane, carbon tetrachloride etched by chloroform and acetone	As for copolymer	Similar chemical and solvent resistance
2. Water absorptivity	1.2%	0.4%	Copolymer more polar
3. Hardness Rockwell "R" value	32	65	Coplymer is less elastic
4. Scratch resistance Minimum weight for penetration of 0.05μm and 0.10μm film	50g	100g	
5. Film hardness (Sward rocker)	24	21	Copolymer more rigid cross linked structure
6. Rigidity-bendfail test. Mandrel diameter 2mm	fail	pass	
7. Adhesion-failing force in plywood samples (BS 1203)	268 N	716 N	Copolymer is less flexible Neither polymer is suitable as an adhesive for plywood when compared with Urea-formaldehyde (1220 N)