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Acrylic Pressure-Sensitive Adhesives (Acrylic-PSAs) with high transparency and removability according to the solids content.

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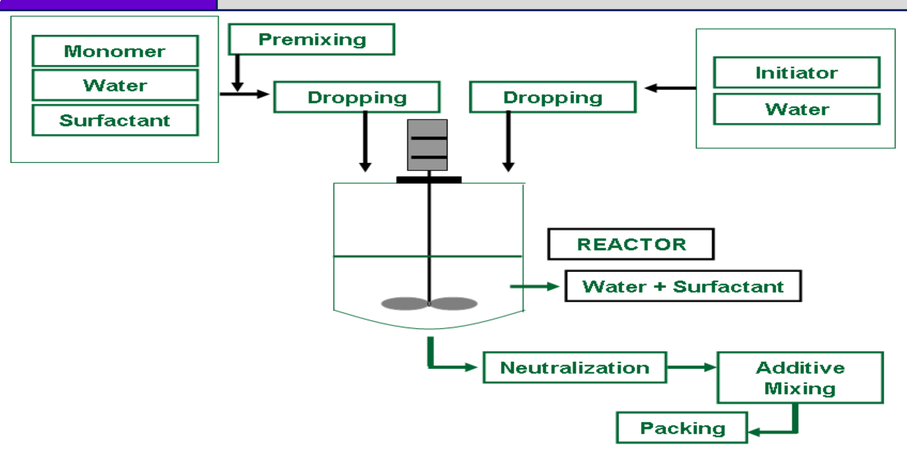
Abstract

Water-borne acrylic pressure-sensitive adhesives(PSAs) with high transparency and removability were studied, using various acrylic monomer species and ratios. By using water as a solvent and emulsion polymerization in the presence of ammonium persulfate (APS) as an initiator, an acrylic latex could be obtained. The solids content was calculated as per ASTM D2834. Analyzed by Fourier transform infrared (FT-IR) spectroscopy for structure of each sample and to confirm the polymerization. T_g (glass transition temperature) characteristics and transmittance were measured using differential scanning calorimetry (DSC) and UV-transmission meter to ensure stability and transmittance. A 180 ° peel test using a universal material testing machine (UTM) was performed by analyzing the pressure sensitive adhesion characteristics of the samples, and the comparative analysis and evaluation were carried out.

Objective

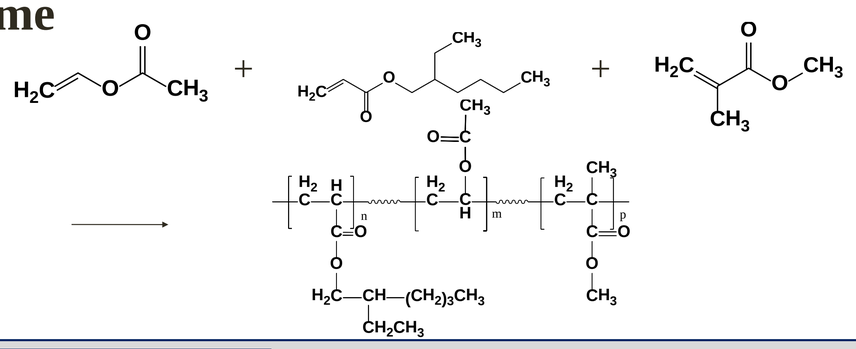
1. The solvent is water and an acrylic emulsion composed of 2-EHA, MMA as adhesive monomer is synthesized.
2. Comparison of characteristics according to monomer types and contents of acrylic adhesives.
3. Comparison of adhesion characteristics according to solids content.

Experimental



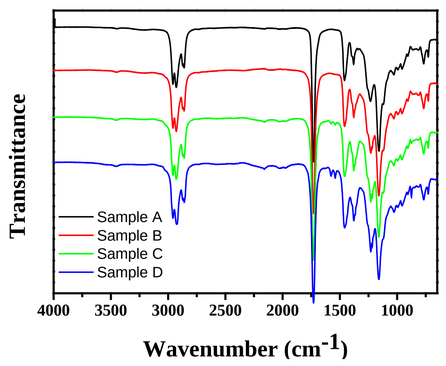
Sample name	Polymer	Monomer : Solvent	Monomer(w/w)	Solvent (w/w)	Surfactant (w/w)	Initiator (w/w)
Sample A (Acrylic acid)	Poly(MMA/2-EHA) 1 : 7.6	1 : 0.6	61.25	36.70	1.7	0.352
Sample B (Acrylic acid)	Poly(MMA/2-EHA) 1 : 6	1 : 0.7	56.61	41.10	1.9	0.39
Sample C (2-HEMA)	Poly(MMA/2-EHA) 1 : 7.6	1 : 0.6	61.25	36.70	1.7	0.352
Sample D (2-HEMA)	Poly(MMA/2-EHA) 1 : 6	1 : 0.7	56.61	41.10	1.9	0.39

Scheme

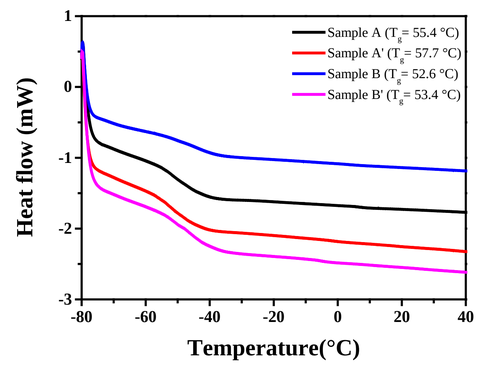


Results

FT-IR



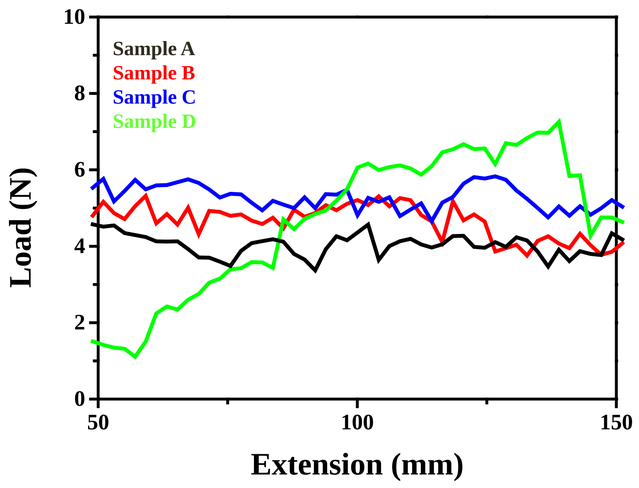
DSC



Solid contents

	Sample A	Sample B	Sample C	Sample D
W_1 (Weight of petridish)	7.8357	6.9864	7.6006	7.4087
W_2 (Weight of petridish along with sample before heating)	8.8326	7.9732	8.5960	8.4037
W_3 (Weight of petridish and sample after heating)	8.4607 (1 h) 8.4222 (12 h)	7.5916 (1 h) 7.5552 (12 h)	8.2078 (1 h) 8.1859 (12 h)	7.9660 (1 h) 7.9569 (12 h)
Solid Contents(%)	62.7 58.8	61.33 57.64	61.00 58.80	56.0 55.1

UTM



	Max Load (N)	Min Load (N)	Average Load (N)
Sample A	4.9626	3.0089	4.048816
Sample B	5.4993	3.2416	4.675547
Sample C	5.8302	4.6563	5.304304
Sample D	7.2575	1.5073	4.516627

Conclusion

- Polymerization was confirmed by disappearing the peak of C=C and the C = O and C-O-C groups of MMA and 2-EHA were identified at 1240-1070 cm $^{-1}$ according to the emulsion synthesis through FT-IR.
- Among the ratios of MMA and 2-EHA, the higher the ratio of MMA, the higher the adhesive properties.
- The lower the solid content, the higher the adhesive properties.

Acknowledgement

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