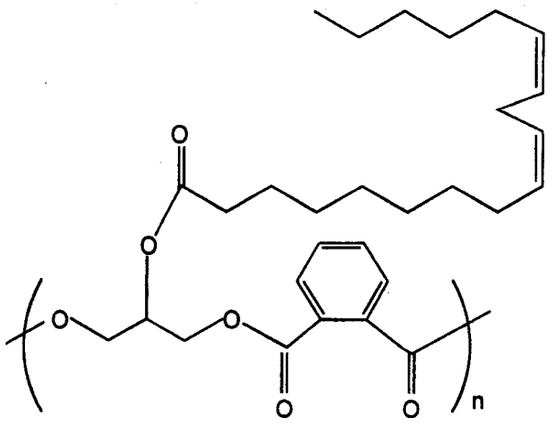
Contents

- Introduction
- Synthesis of Waterborne Acrylic-Modified Alkyd
- Formulation of Paint and its Mechanical Property
- NMR Spectroscopic Analysis
- Conclusion

Structure of Alkyd Resin



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Property Comparison between Alkyd and Acrylic

Property	Alkyd	Acrylic
Tacky-free time	-	+
Hardness	+/-	+
Outdoor durability	-	+
Solvent resistance	+	+/-
Cost	+	-

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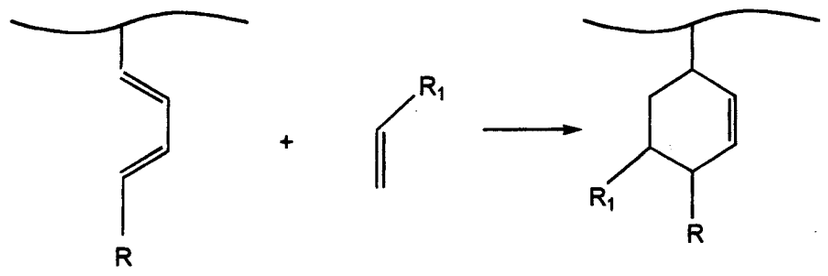
Typical Methods of Acrylic Modification in Alkyd

1. Type Ⅰ : Diels-Alder Reaction



Dehydrated Castor Oil

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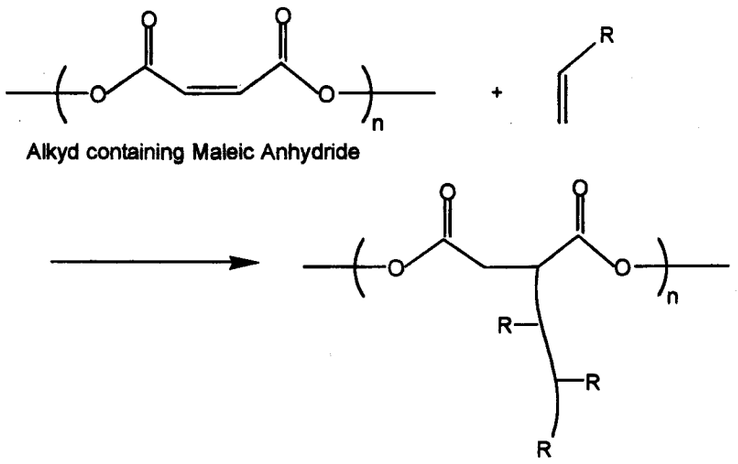
2. Type Ⅱ : Maleic Anhydride Reaction



Alkyd containing Maleic Anhydride

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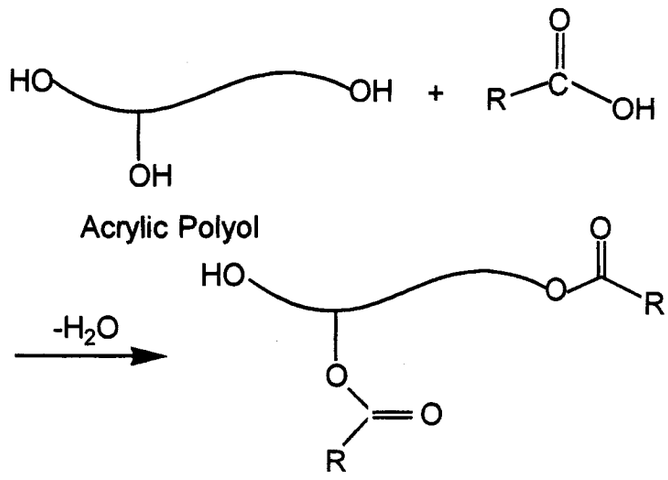
3. Type III : Macromonomer Condensation



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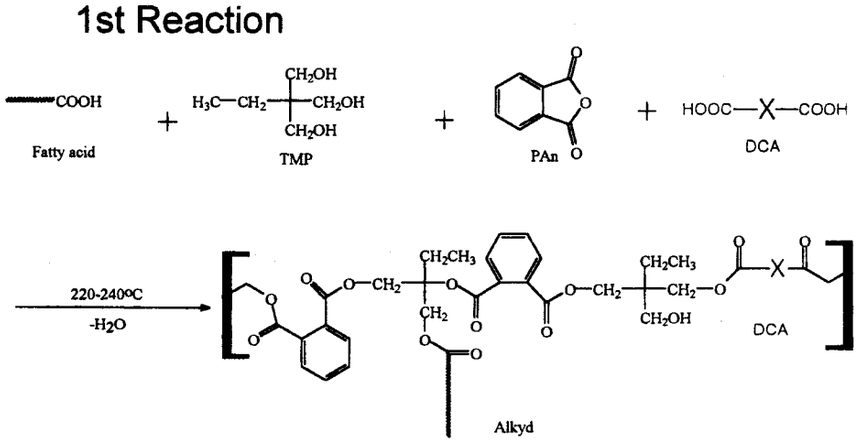
Sequencial Reaction of Waterborne Acrylic-Modified Alkyd

1st Reaction



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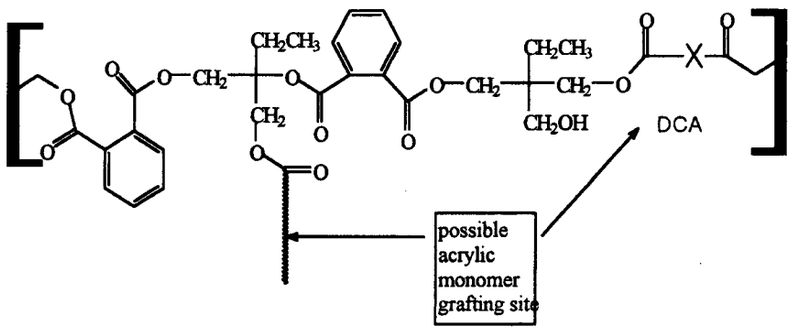
2nd Reaction

Alkyd + Acrylic Monomer $\xrightarrow[\text{benzoyl peroxide}]{130^{\circ}C}$



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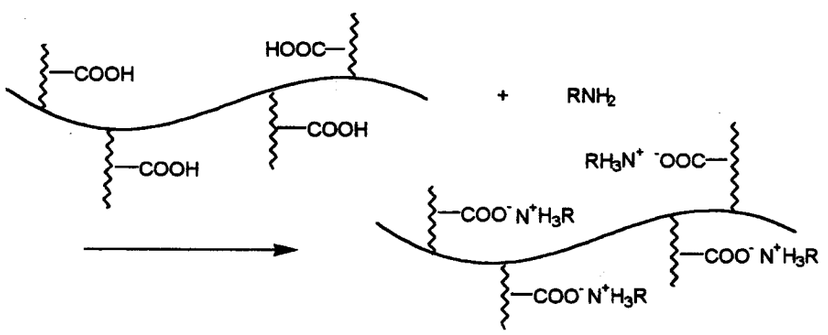
3rd Reaction



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Advantages

- Good compatibility
- Introduction of acrylic portion up to 60%
- Minimum content of unreacted acrylic monomer
- Good long-term stability
- Wide variation of Tg

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Requirements of Industrial Paint

- Lower VOC → Waterborne
- Higher Performance → Excellent Durability, Fast Drying
- More Economy → Low Temp. Curing, Low Cost

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Formulation of Paint

Ingredients	%(by weight)
Water	25.0
Pigments (including anti-rust pigments)	12.0
Waterborne acrylic-modified alkyd	47.0
Additives	5.0
Coalescing agents	11.0
Total	100.0
Paint Specification	
Viscosity(25℃, KU)	80±10
Nonvolatile(% by weight)	40±3
Sp. Gr.	1.10±0.05

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Mechanical Properties of Paint

Film thickness (㎛)[a]	25±5
Pencil hardness	min. HB
Crosshatch adhesion	excellent
Gloss (60 °)	min. 60
Salt spray resistance[b]	excellent
Water resistance[c]	
Blister	excellent
Adhesion	excellent
Shelf life (month, storage stability)	6

[a] Substrate : Zinc phosphate treated panel
[b] Test cond. : 5% NaCl salt fog(240hrs.) at 35℃
[c] Test cond. : Immersed in water for 7days

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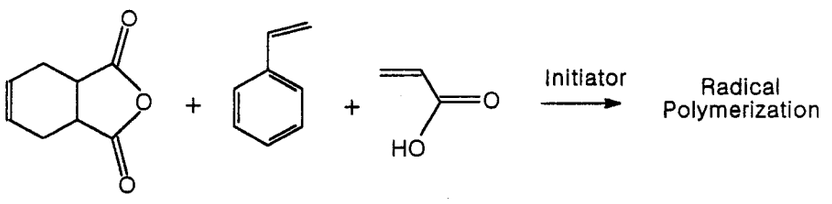
Model Reaction



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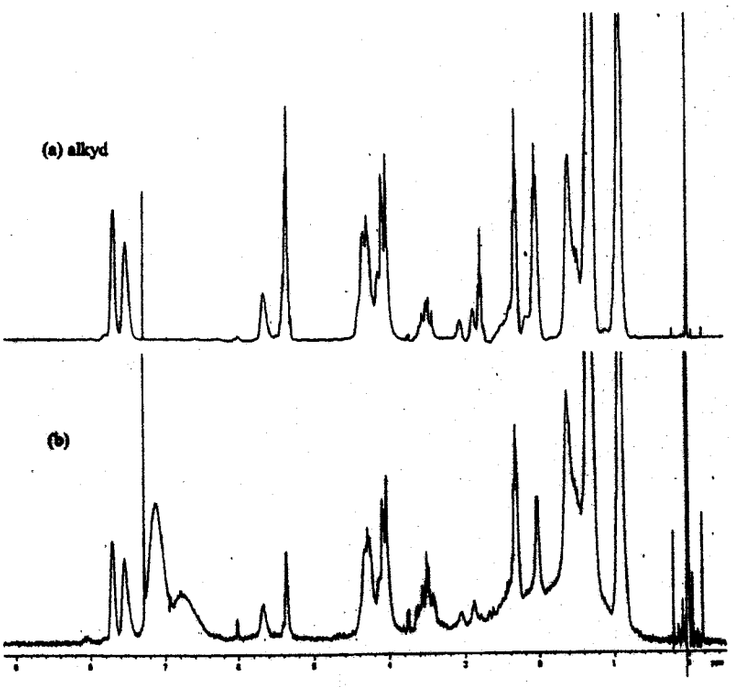

Proton NMR spectrum of (a) alkyd and (b) acrylic-modified alkyd

Conclusions

1. The waterborne acrylic-modified alkyd was synthesized under mild condition and acrylic portion in alkyd was introduced up to 60%.
2. The waterborne acrylic-modified alkyd was applied to corrosion protective paint to give excellent mechanical properties : excellent adhesion, fast drying, low temp. curing, excellent salt spray and water resistance.
3. In this reaction, we were able to identify that the radical polymerization is occured at the allylic carbon in DCA.