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Effect of silane content in Acrylic polymer binder with high transparency, good adhesive strength, and water resistance

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Abstract

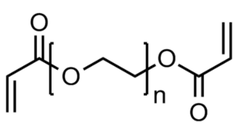
In consideration of external stimulus and conditions of passing vehicles, the phosphorescent material and acrylic polymer binder for application of road markings is necessary as road safety improvement technology. Acrylic polymer binder series were blended on various ratio using polyethylene glycol 400 diacrylate, methylmethacrylate, 2-Hydroxyethyl methacrylate, Neocryl, benzoylperoxide(BPO), N,N-Bis(2-hydroxyethyl)-paratoluidine(Bisomer PTE) and silane. Designed acrylic polymer binder with silane exhibited high durability, transparent and moisture barrier properties. Various properties of acrylic polymer binder material with silane as silicon acrylic monomer were studied through universal test machine(UTM), UV-visible spectrophotometer, contact angle meter and fourier transform infrared spectrometer(FT-IR).

Objective

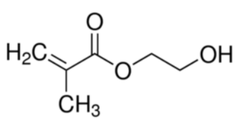
According to monomer contents

1. Characteristics comparison of optical properties
2. Characteristics comparison of adhesive strength
3. Characteristics comparison of wettability

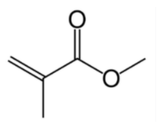
Materials



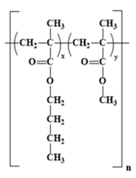
PEG400DA



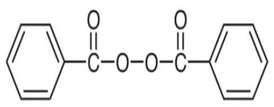
2-HEMA



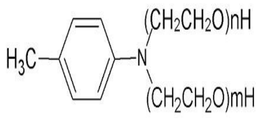
MMA



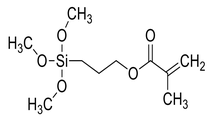
Necoryl



BPO



PTE



TMSPMA

Experimental

Step 1 Blend Acrylic monomer and catalyst

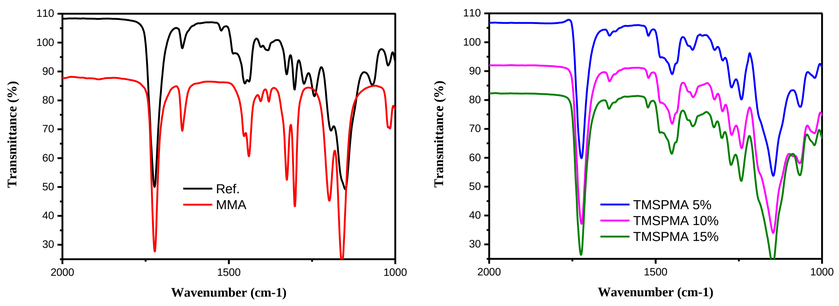
Step 2 Add initiator and Stir

Step 3 Apply adhesive to specimen

Contents table

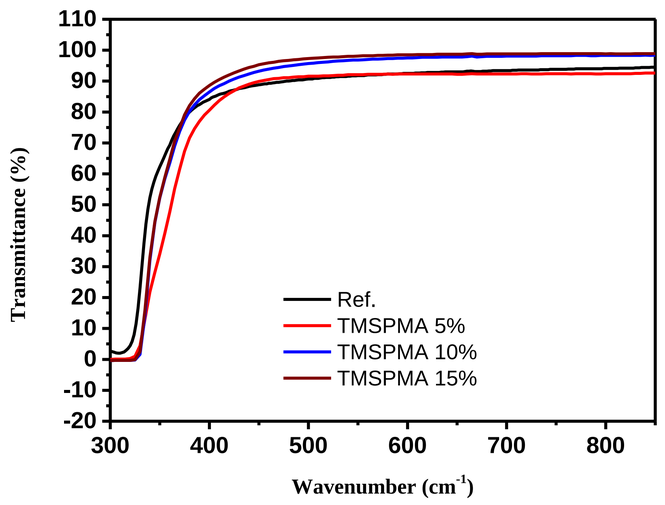
SAMPLE	Ref (wt%)	Sample (wt%)
Reference	1	0
TMSPMA 5%	0.95	0.05
TMSPMA 10%	0.9	0.1
TMSPMA 15%	0.85	0.15

FT-IR



Results

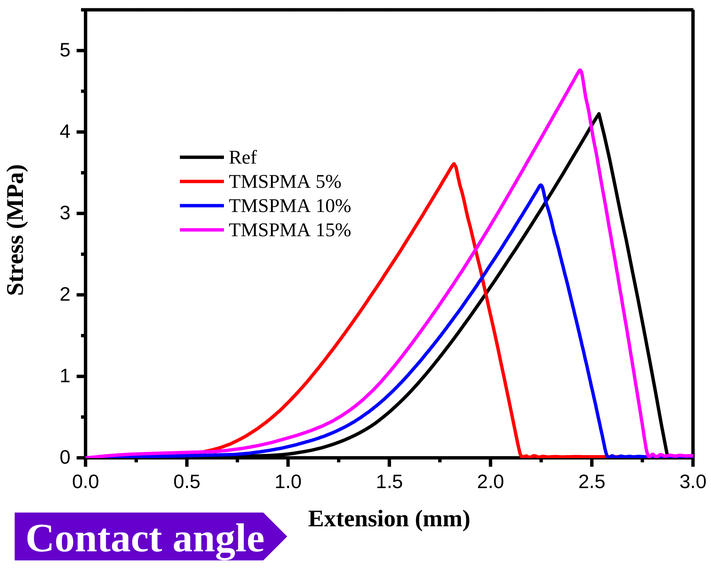
Transmittance



Transmittance at 530nm

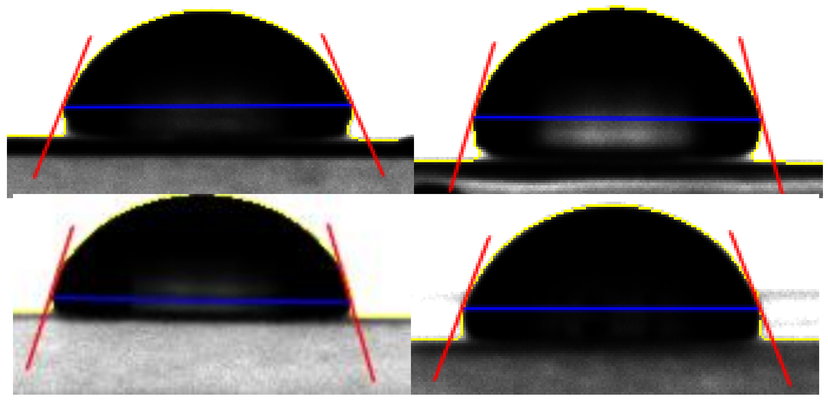
SAMPLE	Transmittance
Reference	91.4
TMSPMA 5%	91.9
TMSPMA 10%	96.5
TMSPMA 15%	97.8

UTM



SAMPLE	Peak strength
Reference	4.223
TMSPMA 5%	3.61
TMSPMA 10%	3.34
TMSPMA 15%	4.75

Contact angle



SAMPLE	Contact Angle
Reference	68.92
TMSPMA 5%	74.87
TMSPMA 10%	75.85
TMSPMA 15%	70.05

Conclusion

- Polymerization was confirmed by decreasing the peak of C=C at 1640 cm^{-1} according to radical reaction through FT-IR
- Transmittance increases as the content of TMSPMA increases.
- Contact angle increases to 10 % of TMSPMA content, and the contact angle decreases from 10 % of TMSPMA content.
- Peak strength decrease to 10 % of TMSPMA content, and the peak strength increases from 10 % of TMSPMA content.
- As Wettability increases, Adhesion Strength increases. Proper content is important.

Acknowledgement

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