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Evaluation of Adhesion and Mechanical Properties of Urethane Acrylic Polymer Binders Using Crosslinking Catalysts

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ABSTRACT

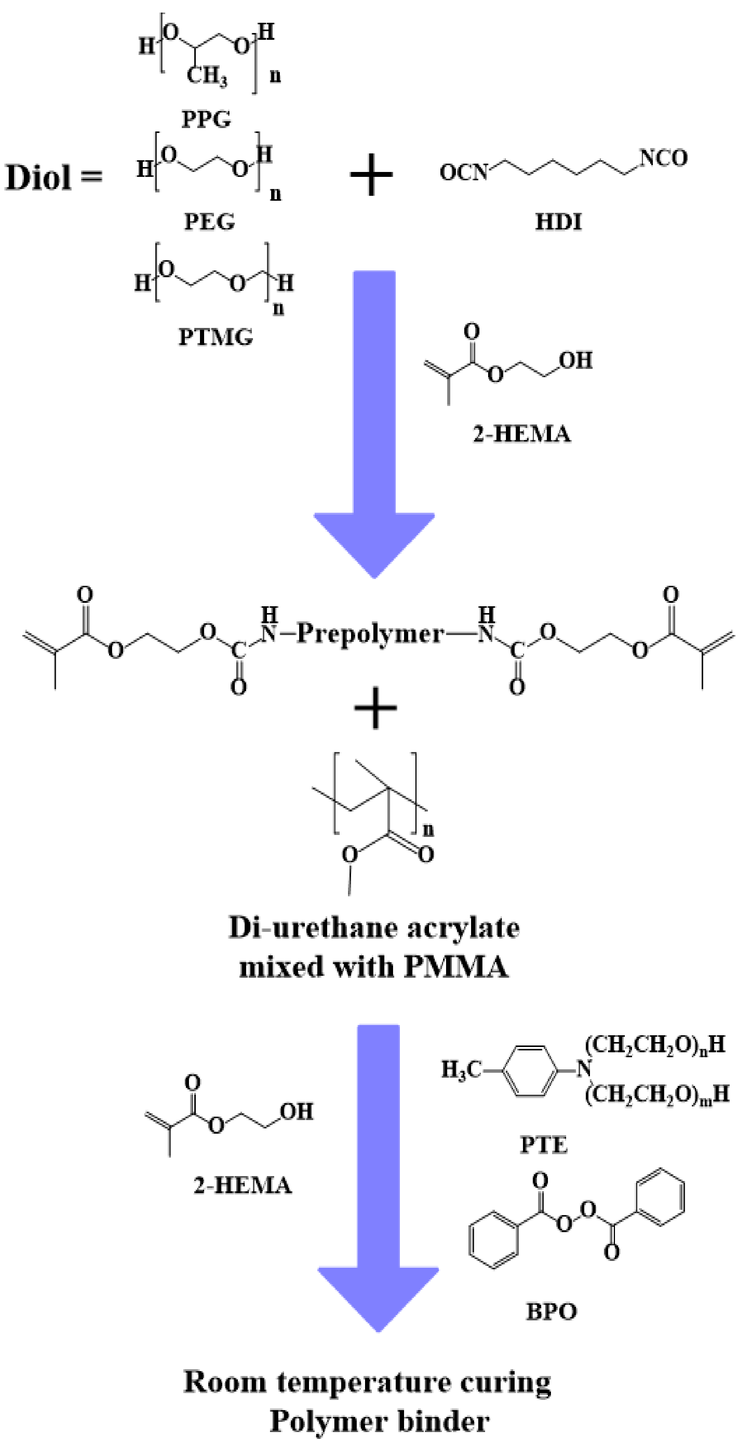
서로 다른 세 가지 폴리올(폴리테트라하이드로퓨란(PTMG), 폴리에틸렌글리콜(PEG), 폴리프로필렌글리콜(PPG))을 이용하여 우레탄 아크릴레이트(UA)를 합성하였다. 각각의 우레탄 아크릴레이트는 폴리메틸메타크릴레이트(PMMA)와 물리적인 혼합 후 가교 역할을 위한 벤조일퍼옥사이드(BPO)촉매와 가교 촉매의 역할을 촉진시키는 디하이드록에틸-p-톨루이딘(PTE) 조촉매를 활용하여 상온 경화 메커니즘에 의해 가교되었다. 폴리메틸메타크릴레이트/우레탄아크릴레이트 바인더의 경우 우레탄아크릴레이트,촉매,기타 첨가제의 조성비에 따라 기계적 특성을 비교 및 분석하였다. 만능재료 시험기를 통해 바인더의 전단접착강도와 인장강도를 평가하였으며 결과적으로 우레탄 아크릴 5~10wt% 조성비에서 향상된 특성을 보였다. 촉매와 조촉매는 1-2wt%로 비율이 조성되었으며 3wt% 이상 첨가될 경우 백색도 측정결과 황변현상이 확인되었다. 본 연구결과에서는 아크릴레이트 고분자 바인더를 구성하는 아크릴레이트와 촉매의 조성비에 따른 기계적 특성을 평가하였으며 최적의 혼합 비율을 나타내었다.

OBJECTIVE

According to monomer contents

1. **Characteristics comparison of optical properties.**
2. **Characteristics comparison of shear stress.**
3. **Characteristics comparison of tensile strength**

EXPERIMENTAL

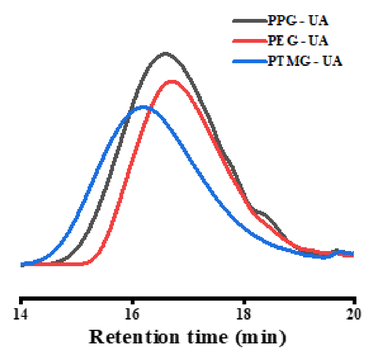


Step 1 Fabrication of synthesized urethane acrylate

Step 2 Compounding with PMMA, additives

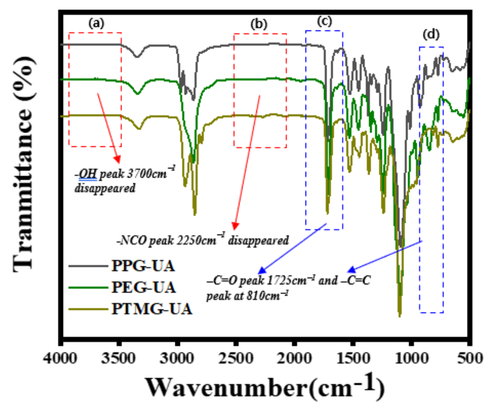
Step 3 Manufacture of dog bone, sus specimens through the press and evaluation of physical properties

GPC



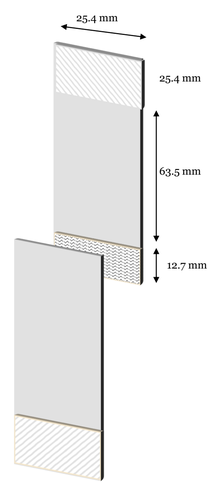
	Mn	Mw	PDI
PPG – UA	7780	15152	1.95
PEG – UA	7053	12904	1.90
PTMG – UA	7874	15434	2.00

FT-IR

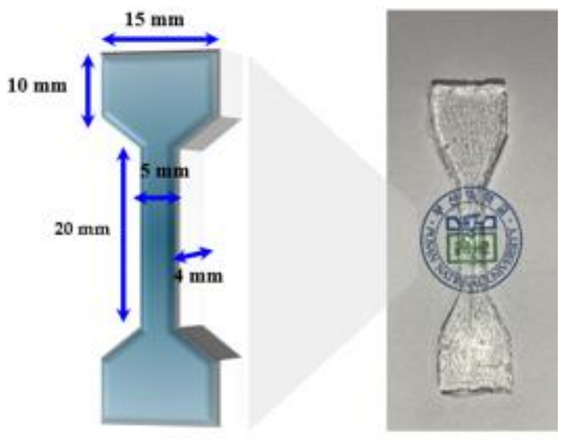


RESULTS

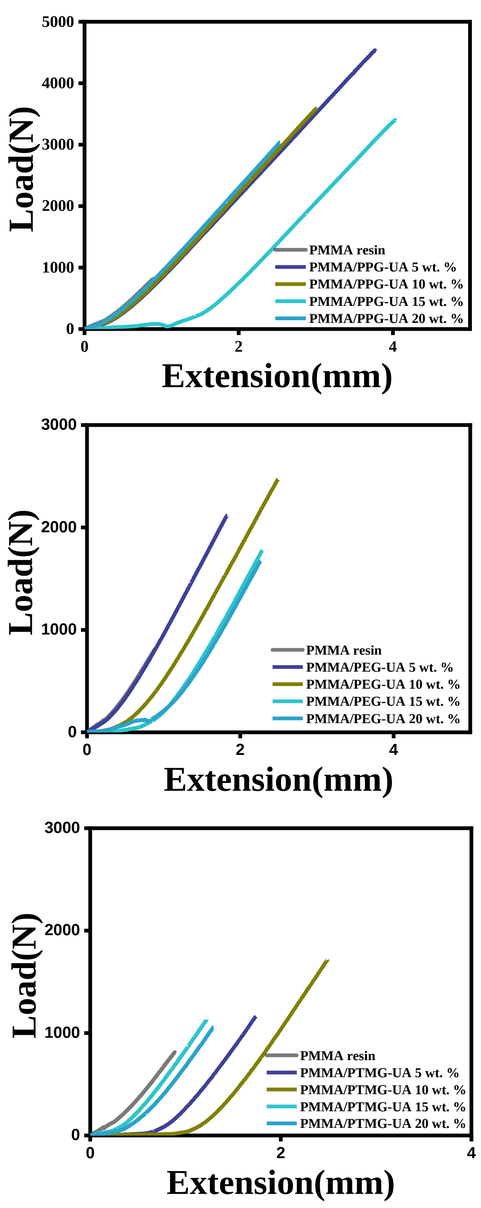
UTM

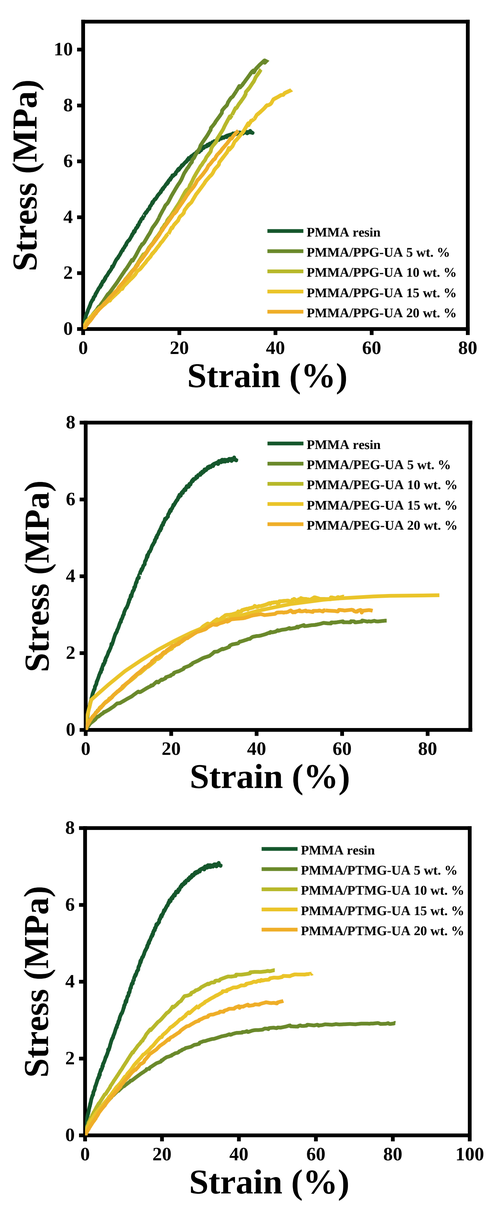


ASTM D1002 specimen



ASTM D638 specimen





(MPa)	Ref.	UA 5 wt%	UA 10 wt%	UA 15 wt%	UA 20 wt%
PMMA/ PPG-UA	2.5	14.6	11.1	10.5	9.4
PMMA/ PEG-UA	2.5	6.6	7.7	5.5	5.2
PMMA/ PTMG-UA	2.5	3.6	5.3	3.5	3.3

(MPa)	Ref.	UA 5 wt%	UA 10 wt%	UA 15 wt%	UA 20 wt%
PMMA/ PPG-UA	7.1	9.7	9.2	8.5	7.1
PMMA/ PEG-UA	7.1	2.8	3.5	3.4	3.1
PMMA/ PTMG-UA	7.1	2.9	4.3	4.2	3.5

CONCLUSIONS

- ✓ **The designed PMMA/UA binder can be cured at room temperature without external energy (light, heat, etc.) due to the heat generated from the reaction with the initiator (BPO) and catalyst (PTE)**
- ✓ **Binder composed of a blend of PMMA and UA, UA using various types of polyols (PPG, PEG, PTMG) was synthesized to have the same or similar molecular weight to compare its performance evaluation**
- ✓ **The optimal mixing ratio was suggested through various content splits so that the de-signed binder shows excellent mechanical properties.**

ACKNOWLEDGEMENT

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