Synthesis and Properties of Polydimethylsiloxane-Polyurethane

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Abstract

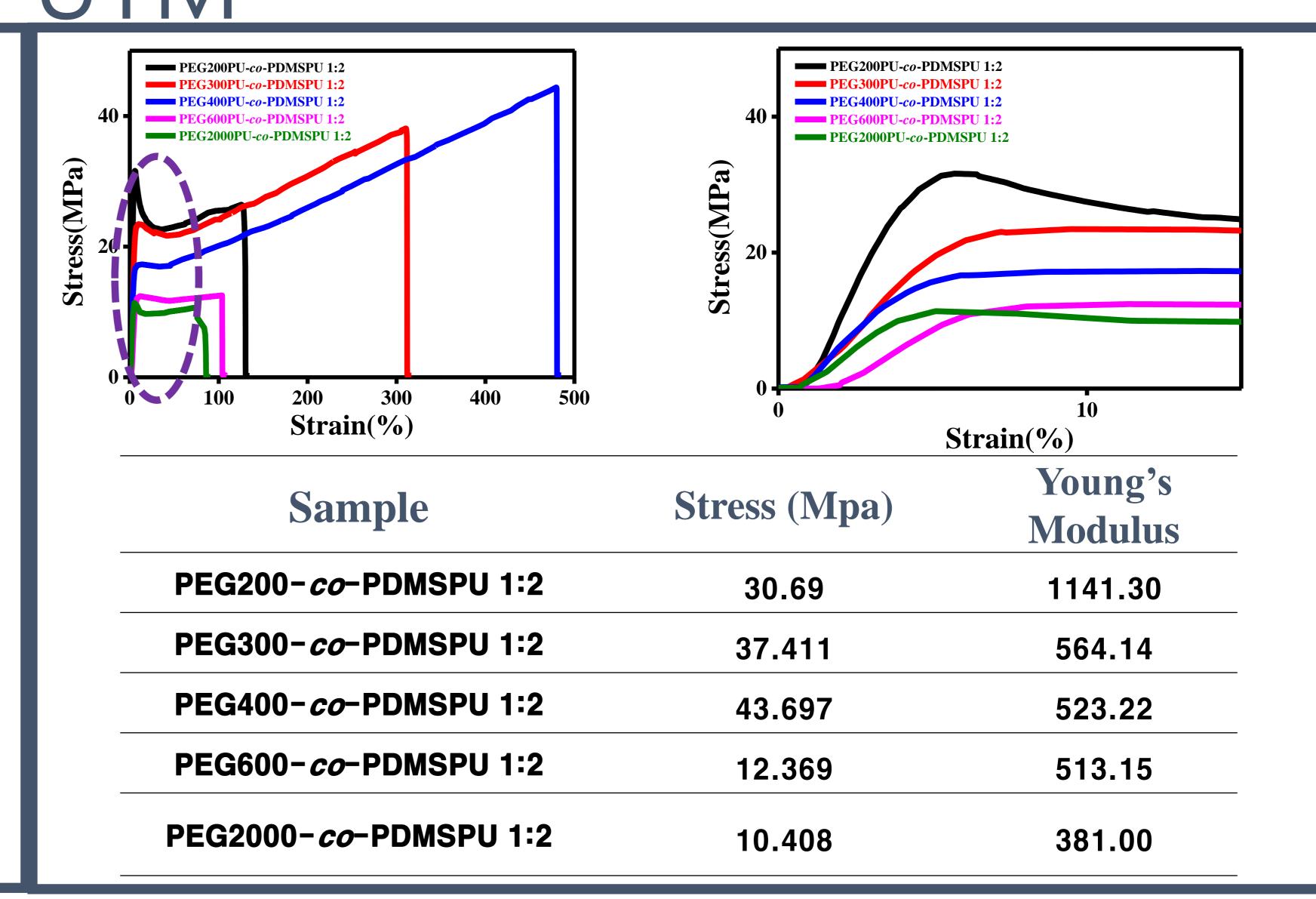
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Polydimethylsiloxane-polyurethane (PDMS-PU) series were successfully synthesized based on the molecular weights the separated soft segments. The mechanical, surface, and water-barrier properties of the resultant PDMS-PUs were evaluated using Universal Testing Machine (UTM), Contact angle, and Water Vapor Transmission Rate (WVTR) Tester. Rich PDMS phase at the air-polymer interface led to the effective phase separation between PDMS segments and urethane segments. Surface energies of PDMS-PUs were the molecular weight and content dependence of PDMS. The optical transmittance and WVTR of PDMS. electronic devices.

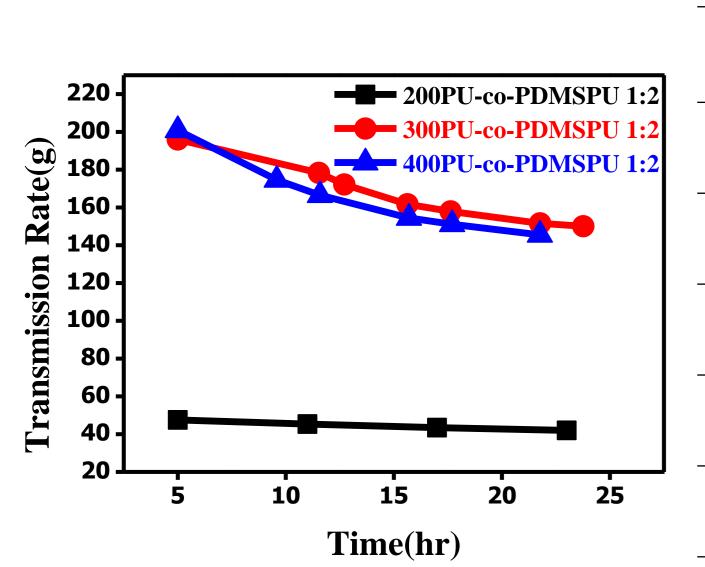
Experiment **Functional** Wave **Prepolymer** number group (MDI+PEG) 60 °C, 3hr -NH₂3300 Added of PDMS 550 Mn PEG400PU-co-PDMSPU 1:2 -CO 2880 60 °C, 1hr **PEG2000PU-***co***-PDMSPU 1:2** <Pre><Pre>Prepolymer (PEG-PU)> Added 2nd Wavenumber(cm⁻¹) **MDI Functional** Wave **70** °C, 6hr number group **Precipitating with** CH₃ sy. bending 1252 **Water and EtOH** Room temp 1052 Si-O-Si PEG200PU-co-PDMSPU 1: **Drying sample** PEG400PU-co-PDMSPU <PEG-PU-co-PDMS-PU> (on dry oven 60°C) CH₃ rocking **790** PEG2000PU-co-PDMSPU 1:2 1500 Wavenumber(cm⁻¹)

PEG200PU PRE 1 PEG400PU PRE 1 — PEG600PU PRE 1 PEG2000PU PRE 1 Time(min) **PEG300-co-PDMSPU 1:2 PEG400-co-PDMSPU 1:2 PEG2000-co-PDMSPU 1:2**

Sample	Mn
PEG200PRE 1	43293
PEG300PRE 1	55506
PEG400PRE 1	58116
PEG600PRE 1	56534
PEG2000PRE 1	43602
Sample	M n
Sample PEG200-co- PDMSPU 1:2	76138
PEG200- <i>co</i> -	
PEG200- <i>co</i> - PDMSPU 1:2 PEG300- <i>co</i> -	76138
PEG200- <i>co</i> - PDMSPU 1:2 PEG300- <i>co</i> - PDMSPU 1:2 PEG400- <i>co</i> -	76138 75776
PEG200- <i>co</i> - PDMSPU 1:2 PEG300- <i>co</i> - PDMSPU 1:2 PEG400- <i>co</i> - PDMSPU 1:2 PEG600- <i>co</i> -	76138 75776 78569



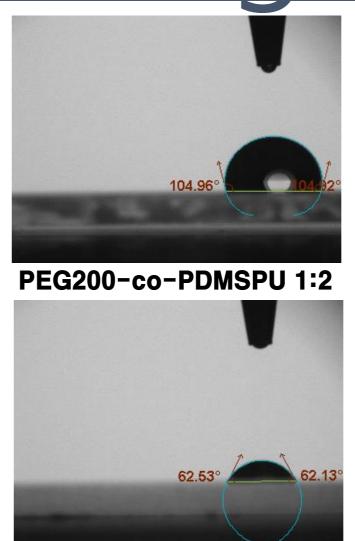
Contact Angle



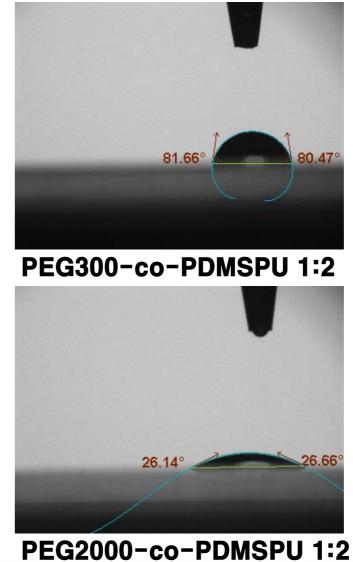
Time(min)

Sample	TR(g)
PEG200PU- <i>co</i> - PDMSPU 1:2	43.53714
PEG300PU- <i>co</i> - PDMSPU 1:2	150.084
PEG400PU- <i>co</i> -PDMSPU 1:2	145.4596
PEG600PU- <i>co</i> -PDMSPU 1:2	FAIL(>250)
PEG2000PU- <i>co</i> - PDMSPU 1:2	FAIL(>250)

Normal Slide Glass	
70.08° 69.21°	
PEG400-co-PDMSPU 1:2	



PEG600-co-PDMSPU 1:2



Sample	Contact
PEG200PU-co-PDMSPU	Angle 104.96
1:2 PEG300PU- <i>co</i> -PDMSPU	
1:2 PEG400PU- <i>co</i> -PDMSPU	81.66
1:2	70.08
PEG600PU- <i>co</i> -PDMSPU 1:2	62.53
PEG2000PU- <i>co</i> -PDMSPU 1:2	25.14

- 1. The successful synthesis of PEG-PDMS-PU using both PEG and PDMS blocks as soft segments
- 2. The good water barrier property of PEG200-PDMS-PU due to flat molecular packing structure
- 3. The high contact angle caused rich hydrophobic phase by many urethane groups.
- 4. The high Young's modulus of PEG200-PDMS-PU due to the strong H-bonding

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