

Effect of aliphatic poly(carbonate diol) and graphene oxide on polyurethane for water barrier film

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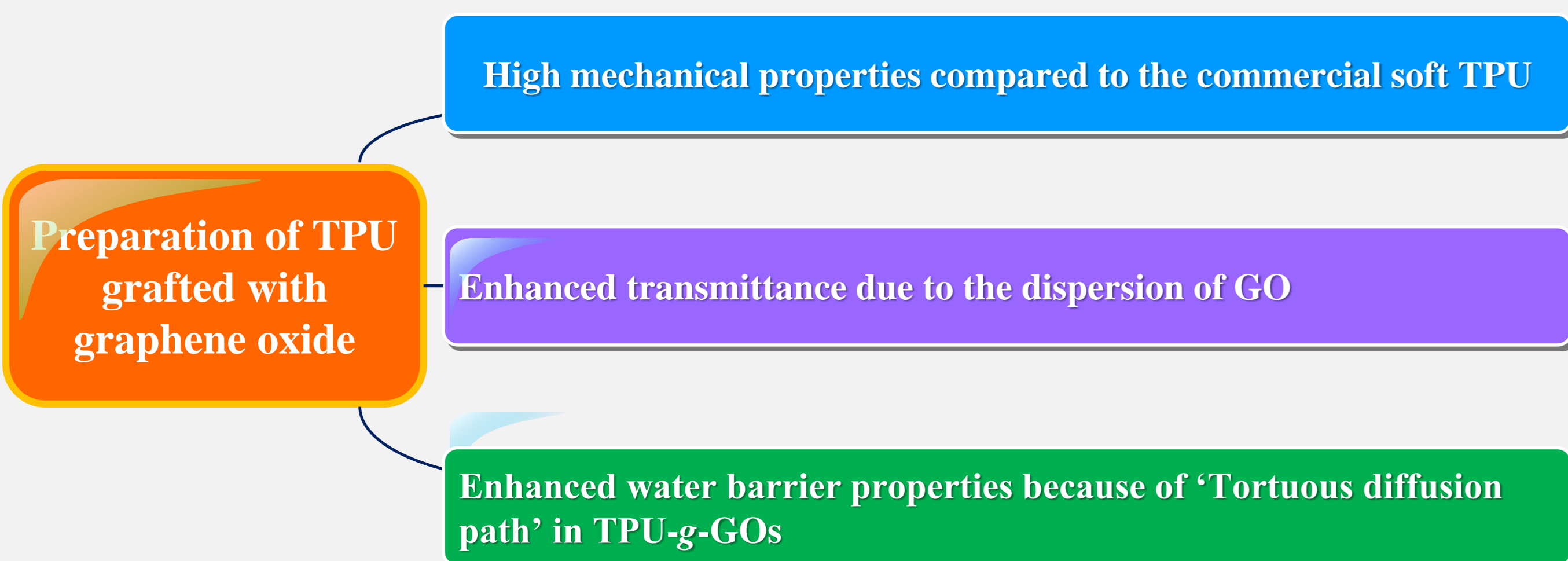
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Abstract

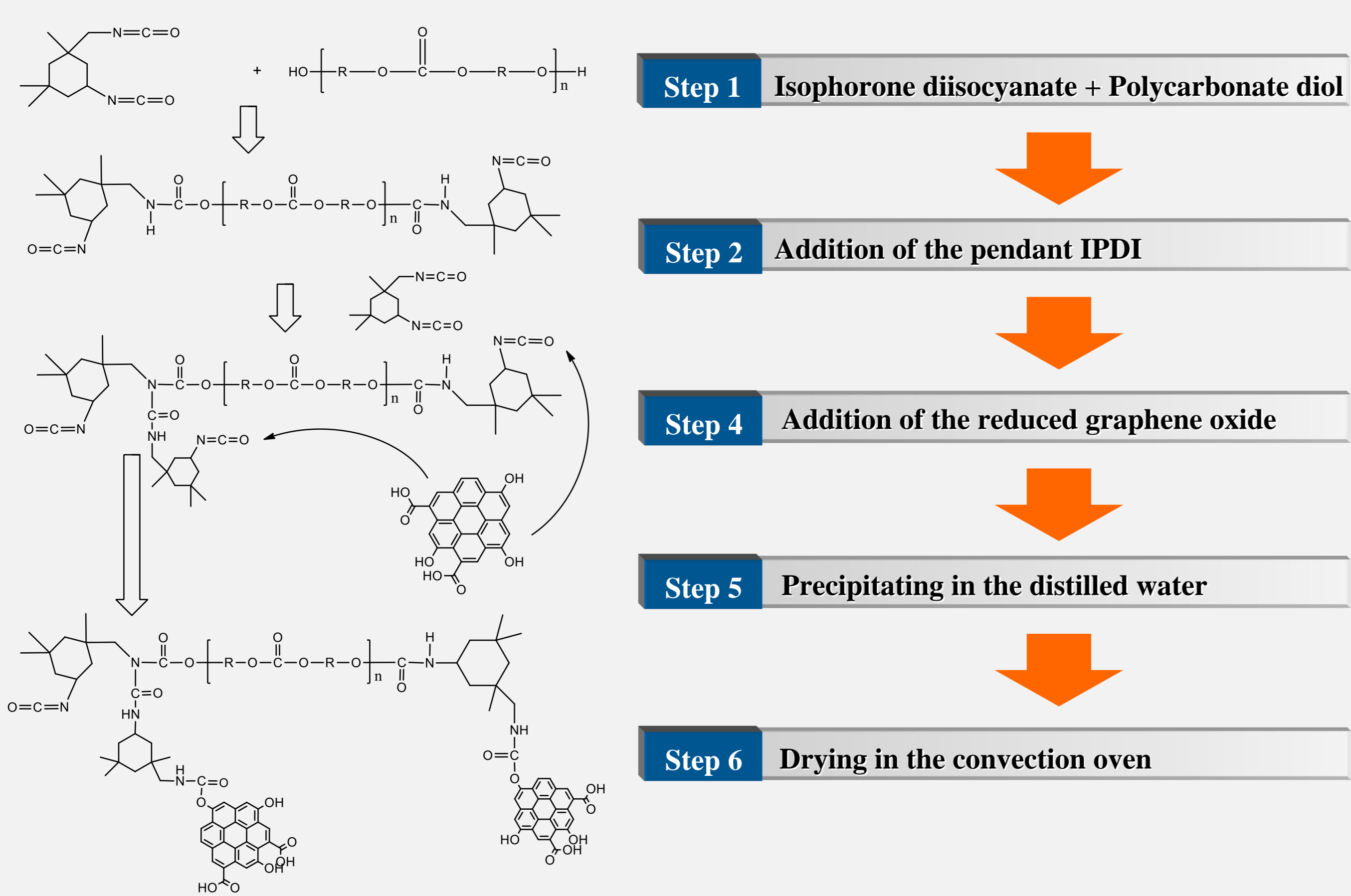
Thermoplastic polyurethanes (TPUs) series were synthesized using one-fixed isophorone diisocyanate (IPDI) and two types of aliphatic polycarbonate diol (PCD), which functionalize as the different molecular weight and with/without the pendant alkyl groups. Graphene oxides (GO) were grafted at allophanate sites made from a few excess IPDI contents. UTM, UV-spectrometer, and WVTR analysis of pure TPU and hybrid TPU-g-GO were carried out to elucidate the various properties and the effectiveness of water-resistant films. It was found that GOs in TPU matrix have strong chemical or interfacial bonding, which led to a high dispersion state. The optical transmittance changed little with the addition of GOs. Water vapor permeability values of TPU-g-GO series varied from 136.49 to 30.14 g/m²day.

Objective

1. To synthesize a PCD-PU series using PCD with/without pendant alkyl group as a polyol and IPDI as an isocyanate
2. To evaluate the physical properties of PCD-PU-g-GOs grafted with the graphene oxides
3. To compare the water-resistance of PCD-PU and PCD-PU-g-GOs

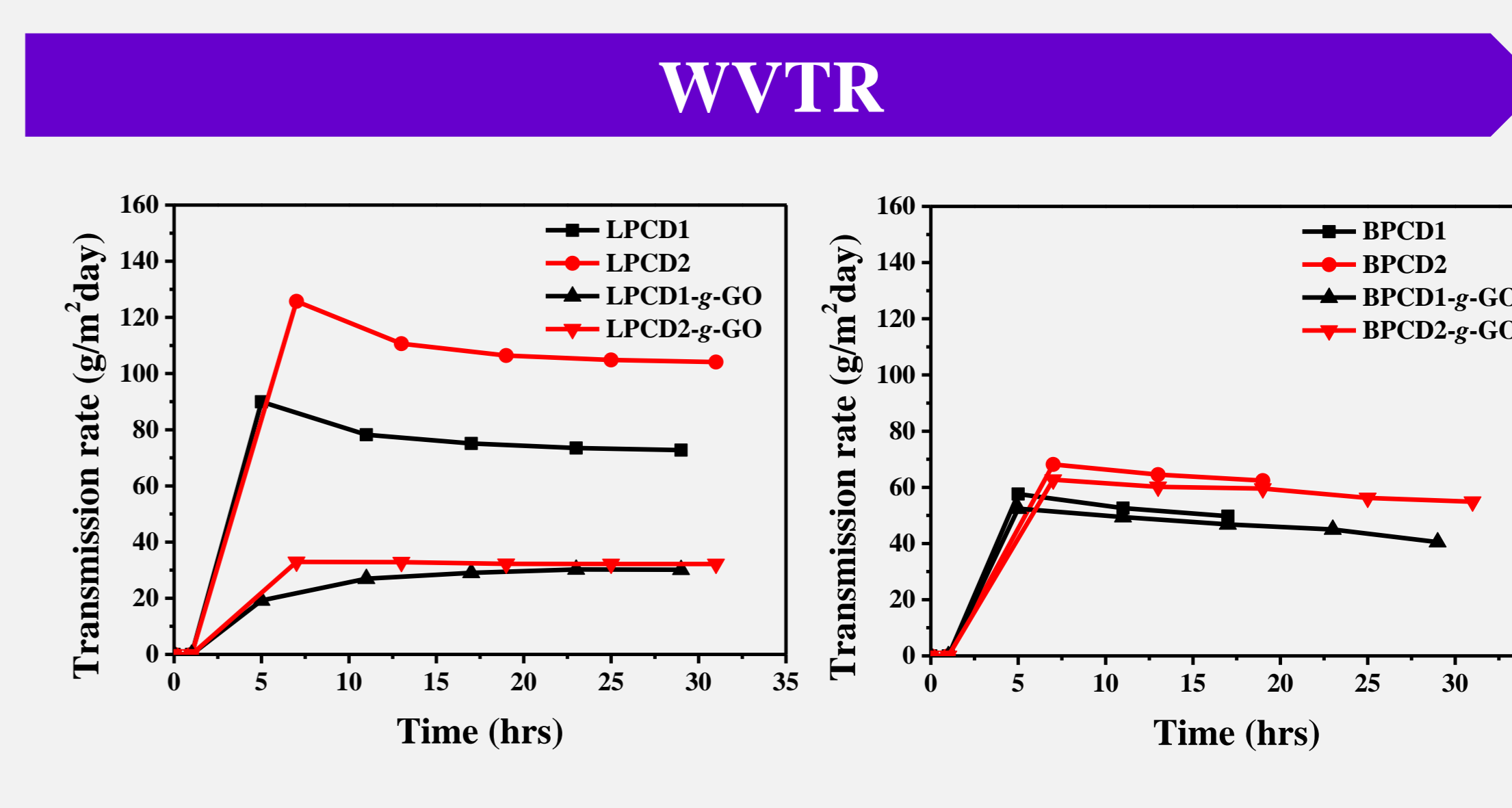
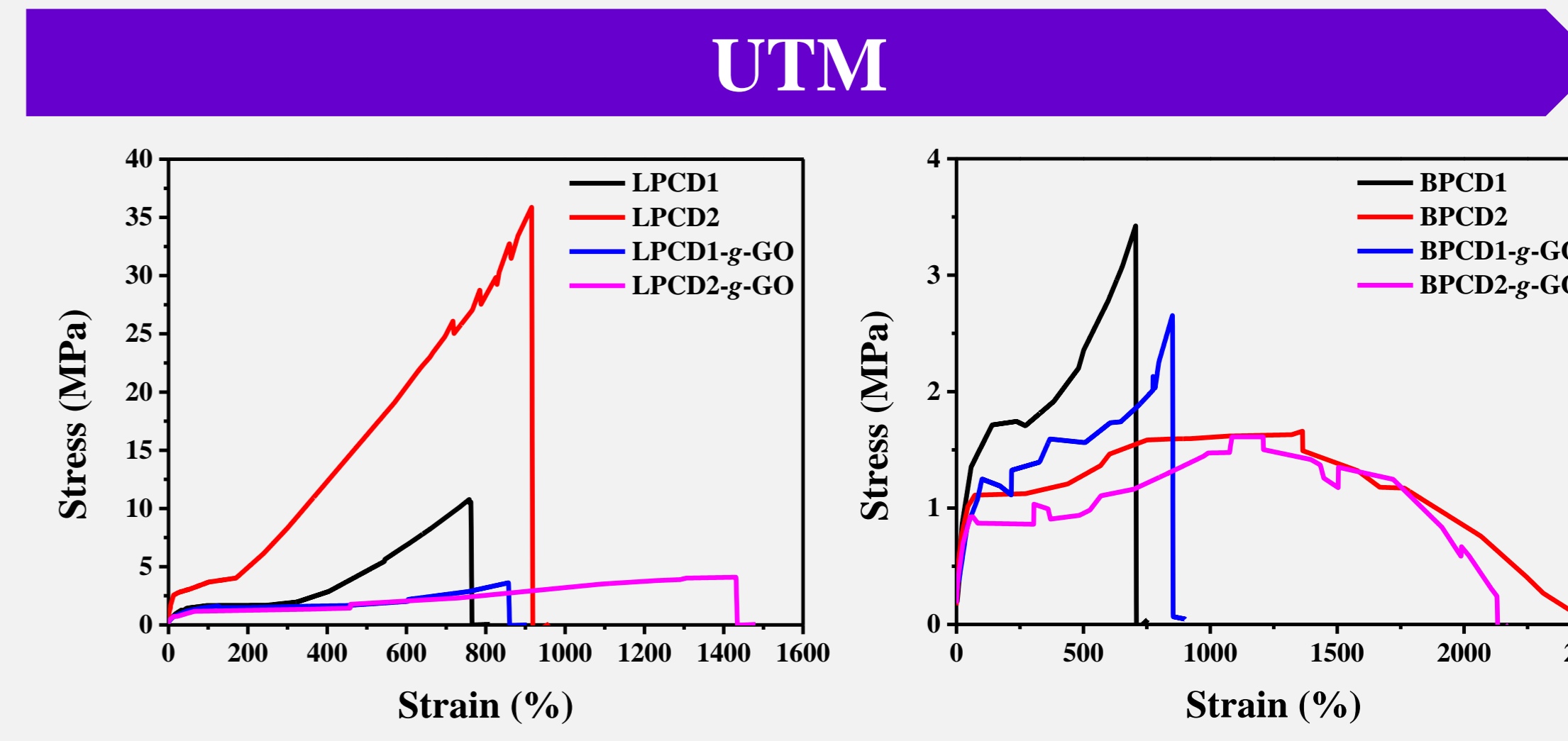
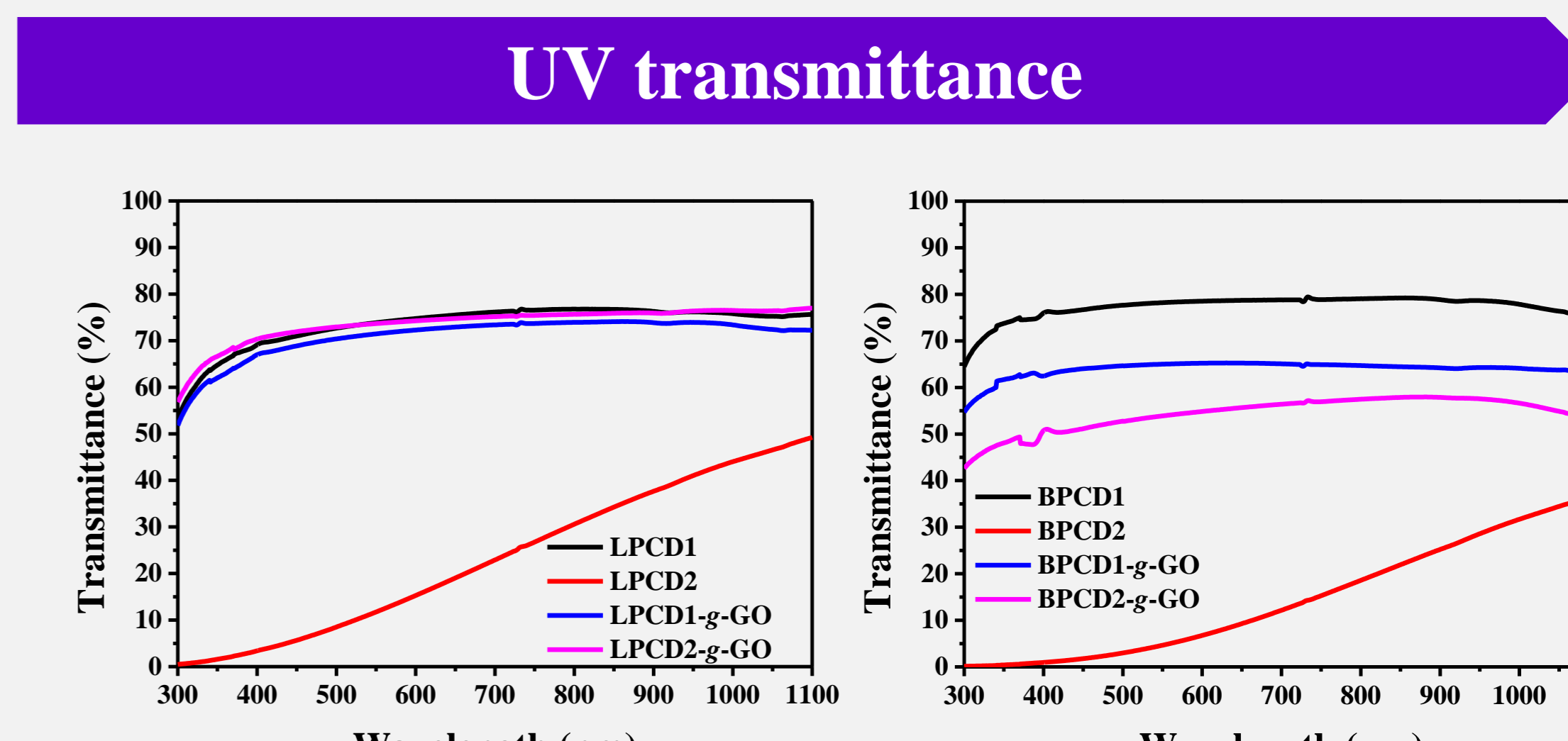
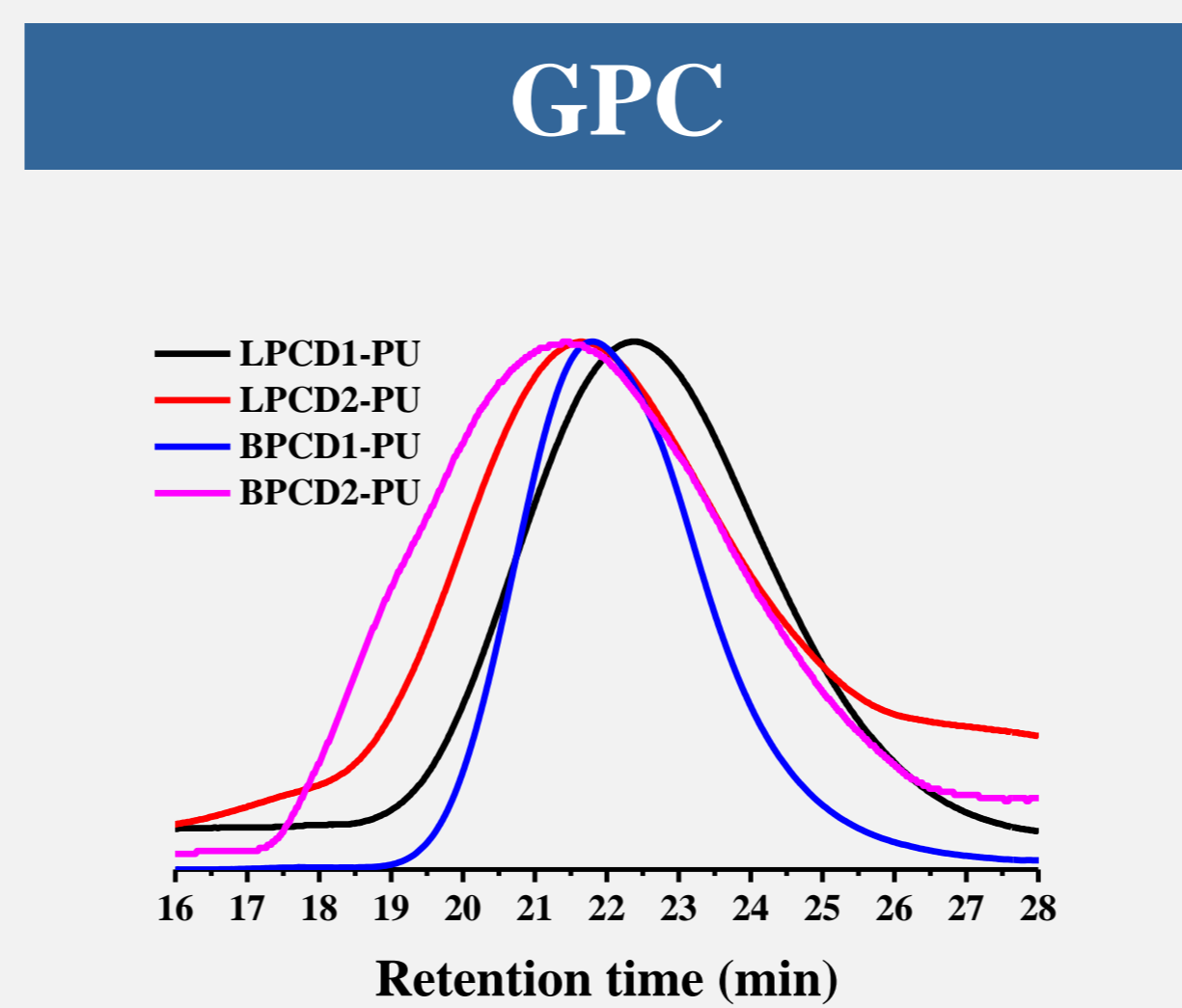
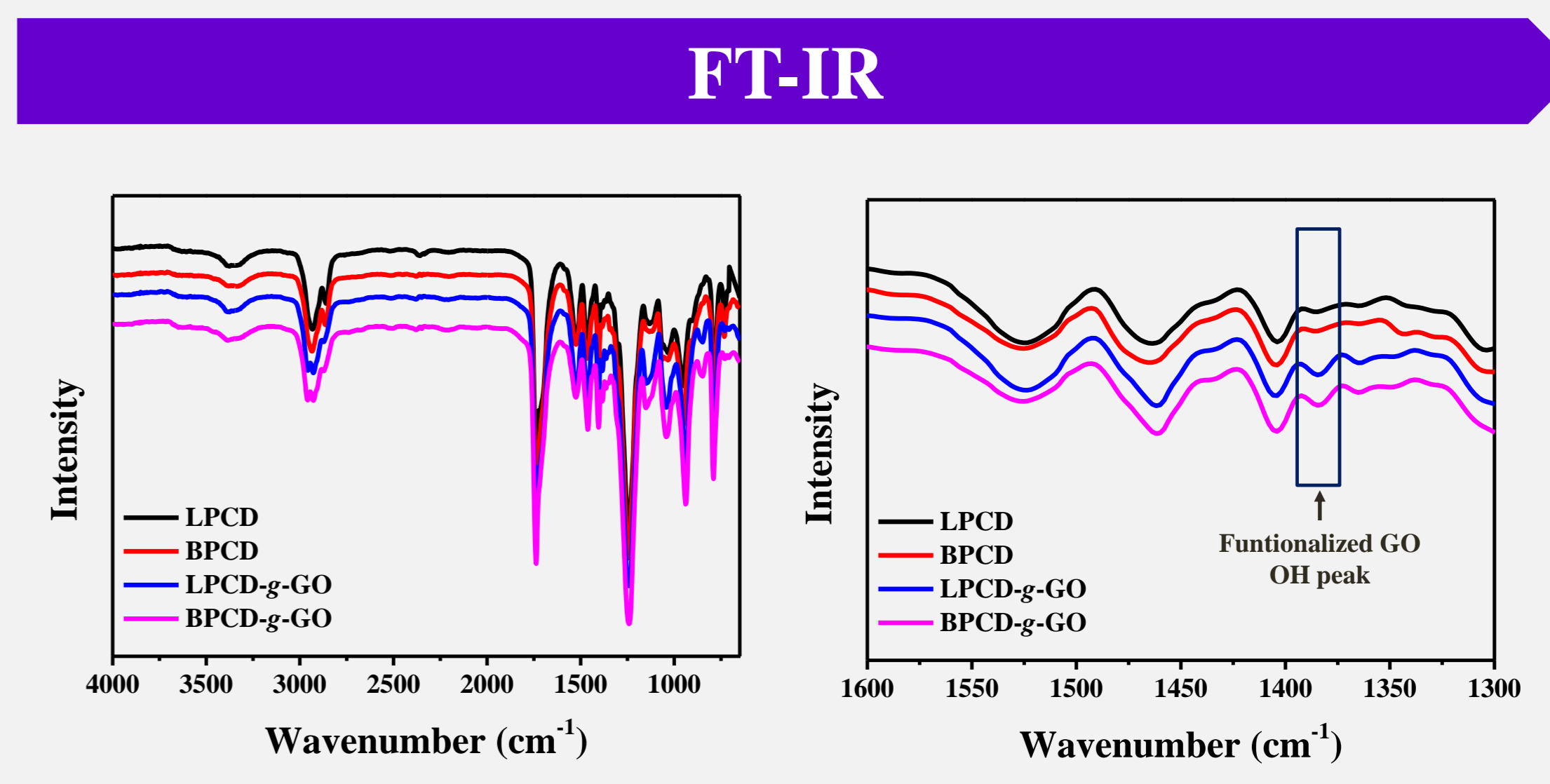


Experimental



Results

Linear or branch PU (PCD MW)	PU-g-GO
LPCD1 (1000)	LPCD1-g-GO
LPCD2 (2000)	LPCD2-g-GO
BPCD1 (1000)	BPCD1-g-GO
BPCD2 (2000)	BPCD2-g-GO



Conclusion

- The successful graft-reaction of PCD-PU and GO based on the allophanate functional groups
- The high transmittance value of LPCD-PU-g-GO (UV transmittance of 1mm thickness film : 73.66%)
- The low transmittance value of the LPCD-PU-g-GO for applying the high-performance film (WVTR : 30.14 g/m²·day)

Acknowledgement

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