

Aliphatic Poly(carbonate diol)-Polyurethane grafted with Graphene oxides for Water-Resistant Film

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Abstract

Thermoplastic polyurethanes (TPUs) series were synthesized using one-fixed isophorone diisocyanate (IPDI) and two types of 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 composed of PCD with/without pendant alkyl group a polyol and IPDI as an isocyanate
2. To evaluate the physical properties of PCD-PU grafted with the graphene oxide
3. To compare the water barrier properties of PCD-PU and PCD-PU-g-GOs

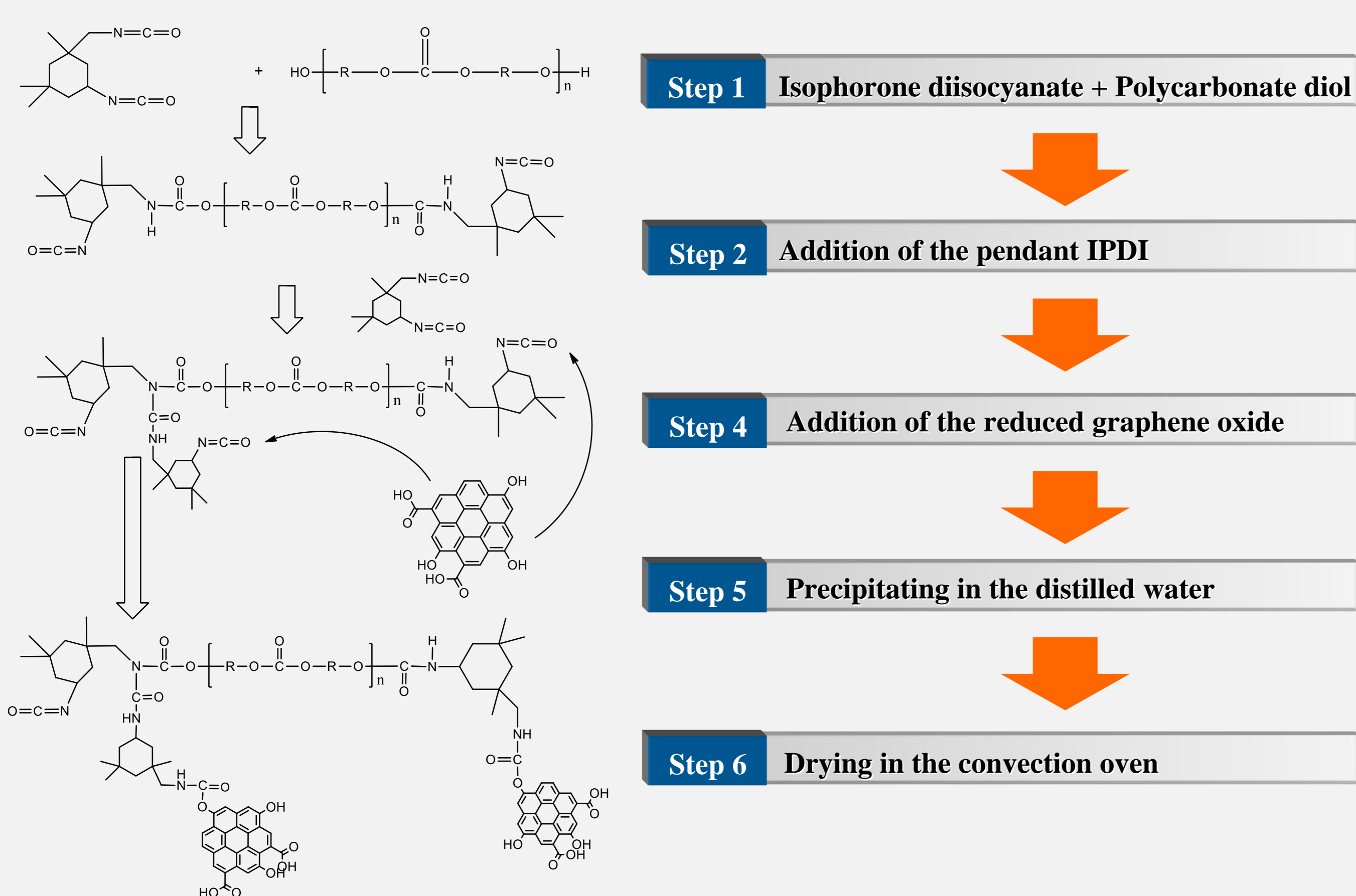
Preparation of TPU grafted with graphene oxide

High mechanical properties compared to the commercial soft TPU

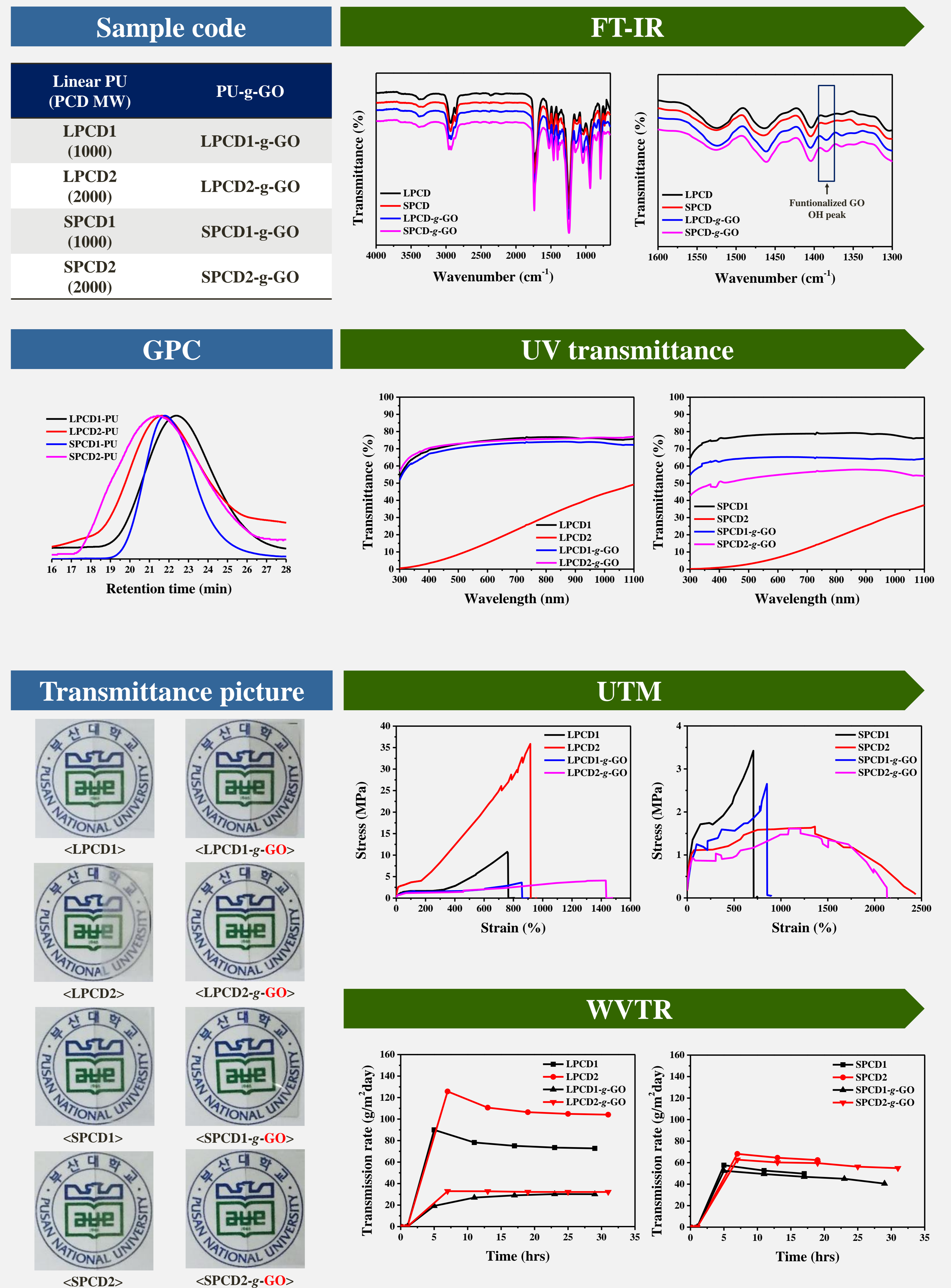
Enhanced transmittance due to the dispersion of GO

Enhanced water barrier properties because of 'Tortuous diffusion path' in TPU-g-GOs

Experimental



Results



Conclusion

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

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