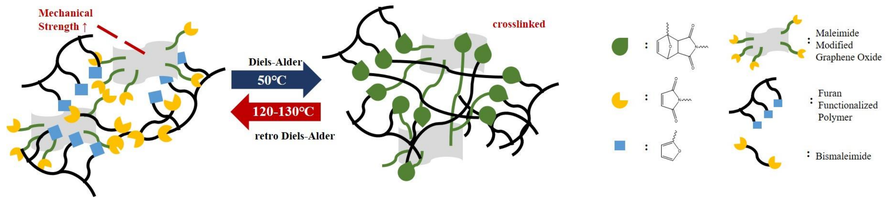
Study on maleimide functionalized graphene oxide for self-healable polymethacrylate based on Diels-Alder reaction

Won-Ji Lee, B.S., Department of Chemical Engineering, Kyonggi University, Korea
Sang-Ho Cha, Assoc.Prof., Department of Chemical Engineering, Kyonggi University, Korea

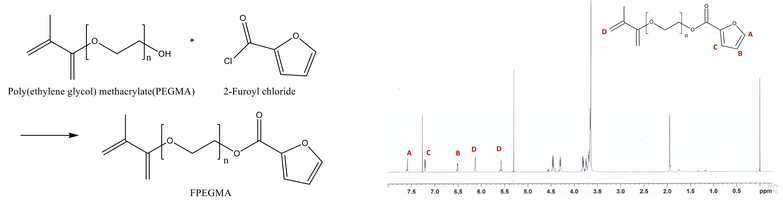
ABSTRACT



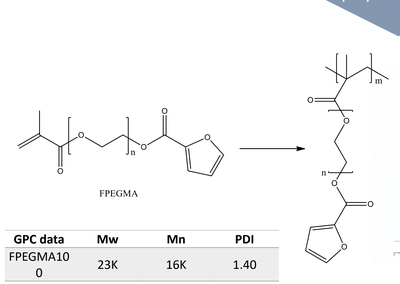
Recently, there have been various studies on self-healing. Among them, there is a lot of research on reversible self-healing which can be repeated healing. In this study, We prepared the material having the self-healing ability and mechanical strength. First, the GO is modified using the Hummer's method. Thereafter, The maleimide group is then included in the GO using the urethane reaction. The GO containing maleimide group was analyzed using fourier transform infrared spectroscopy(FT-IR) and thermogravimetric analysis(TGA). The GO containing the prepared maleimide group forms a film using diels-alder reaction. Then, the mechanical properties were measured using a universal testing machine (UTM).

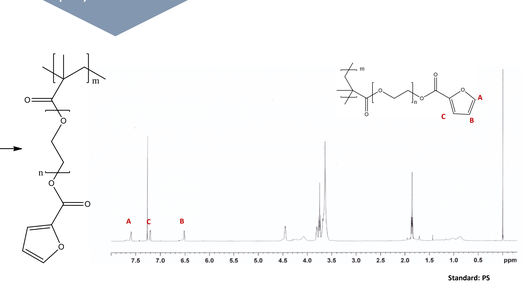
EXPERIMENTAL & CHARACTERIZATION

❖Furan functionalized polymer



Free-radical polymerization

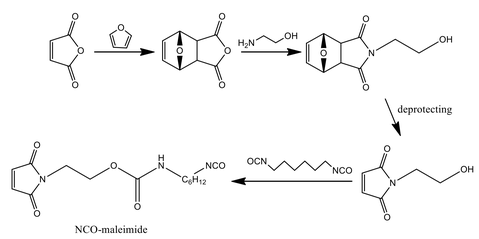




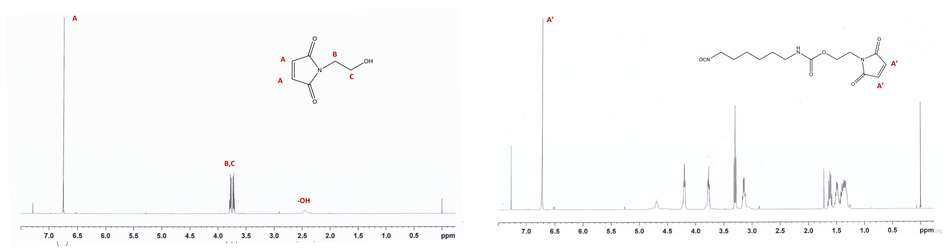
GPC data	Mw	Mn	PDI
FPEGMA100	23K	16K	1.40

❖Maleimide modified GO (mGO)

- Scheme

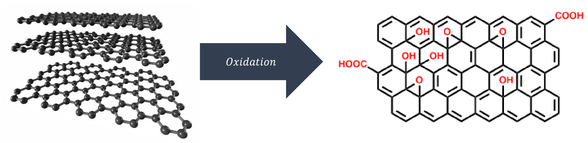


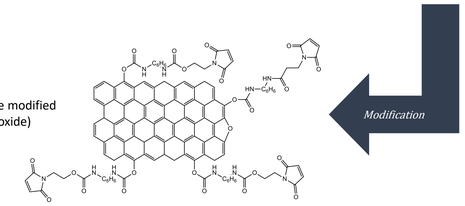
-^{1}H NMR analysis

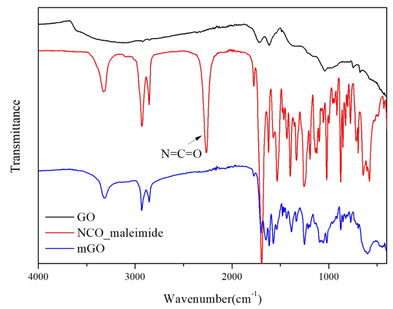


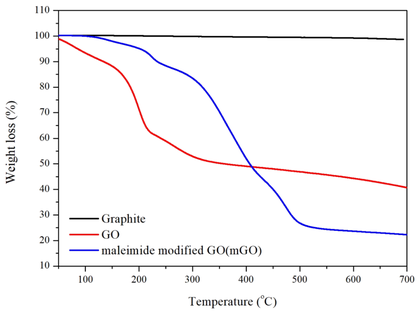
❖Graphene oxide (GO)

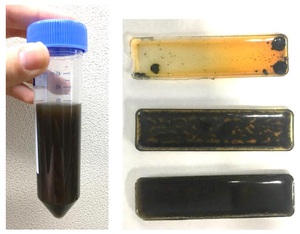
: Modified Hummer's method was used for GO synthesis.









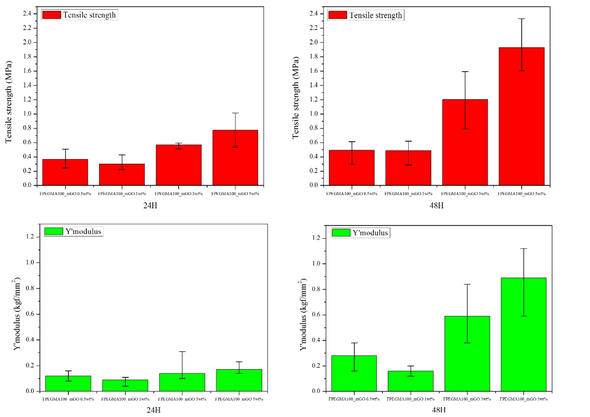


- Structure of GO and mGO was confirmed via FT-IR.
- The organic fraction of synthesized GO and mGO was analyzed by TGA.
- The nanocomposite film was successfully fabricated.

❖Universal testing machine (UTM)

Reaction Time↑
mGO Ratio↑

Tensile Strength ↑
Y'modulus ↑



CONCLUSION

- ✓ Furan functionalized polymethacrylate copolymer was polymerized by free radical polymerization. Structure of polymer was confirmed through ^{1}H NMR.
- ✓ In order to increase the physical properties of the polymer film, the GO selected as the nanocomposite was synthesized by the modified hummers method.
- ✓ Isocyanate monofunctionalized maleimide (NCO-maleimide) was prepared. Then, the maleimide were functionalized to GO (mGO). The structures were confirmed via FT-IR and ^{1}H NMR .
- ✓ mGO was successfully dispersed in polymer film. And the mechanical strength was evaluated via universial testing machine(UTM). Self-healing tests of these nanocomposite films will be conducted later.