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Development of Pseudo-Surface Modification Method for Graphene

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Abstract. In recent years, it cannot be denied that it is more difficult to imagine spending a day without the help of electronic devices in modern technologies. However, these devices consume power and generate intense heat, and caused low efficiency and performance. Therefore, thermally conductive polymer composites for electronic devices is generating a lot of interest in various fields. Recently, graphene has attracted enormous attention owing to its remarkable properties. It is flexible, lightweight, ultra-strong, and highly conductive in both electrically and thermally. However, due to high surface area, van der Waals and π- π interactions, graphene sheets tend to aggregate and cause dispersion problem in solvents, resulting limit applications. Herein, pseudo-surface modification is proposed, which is a non-covalent modification method, which can maximally preserve graphene's natural structure and its inherent properties. In this study, this facile and cost-efficient way was used to prepare functionalized GO (fGO), which involving aromatic hydrocarbons in polymerization; 2-naphthalene thiol (2-NT) acted as chain transfer agent in radical polymerization with MMA, while 1-naphthalene methanol (1-NM) acted as aromatic agent in ring opening polymerization with ε-CL. SEC profiles and NMR spectra indicated the attachment of aromatic agent on polymer chains. Both fGO showed good dispersion in more solvents compared to GO. In term of thermal conductivity, 0.35wt% fGO-PCL showed 43% improvement compared to PCL with 1-NM. While, 5wt% fGO-PMMA showed 25% improvement compared to PMMA with 2-NT. In summary, proposed pseudo-surface modification able to synthesis fGO with better dispersion and thermal conductivity for applications in electronic devices.