Tribological study of alcohol-assisted photochemical reduction of graphene oxide

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Synthesis of graphene via reducing graphene oxide (GO) has attracted much interest due to its flexible and low-cost characters. However, the residual defects on reduced graphene oxide (rGO) surface such as containing oxygen functional groups (OFGs) and lattice vacancies affect rGO intrinsic properties and hinder the application in the graphene field [1]. To overcome this, the alcohol-assisted method was introduced which was considered to supply additional carbon resource to restore residual defects of GO surface during the reduction process [2]. Previous Raman spectra and electric measurement results showed alcohol-assisted reduced rGO contained less surface defects than no alcohol-assisted reduced rGO [3]. In this study, we measured the tribological properties of rGO reduced in different alcohol solution via lateral force microscopy (LFM). The GO monolayer (synthesis via modified Hummer’s method) was deposited on the hydrogen terminated silicon (H-Si) substrate, then the substrate was photochemically reduced by vacuum ultraviolet (VUV) light in “pure decane solution”, “ethanol (1 mmol • L^{-1}) decane solution” and “methanol (1 mmol • L^{-1}) decane solution”. Fig .1 showed the plots of friction force versus load force of rGO(GO). The rGO reduced with ethanol decane solution (1 mmol • L^{-1}) exhibited the lowest friction force, while the GO exhibited the highest friction force due to their different amount of surface defects and different adhesion force. We also found the organic additives in ethanol solution affected the GO reduction result as well. The Raman spectra, tribological and electrical measurement of rGO reduced in ethanol decane solution which containing different organic additives have been obtained and will be discussed in the conference.

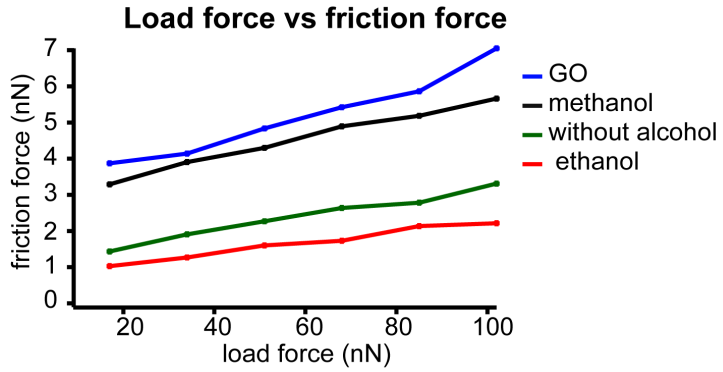

Fig.1 Friction force versus various load force plots of GO, rGO reduced in pure decane solution, rGO reduced in methanol decane solution and in ethanol decane solution

References

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