Electronic Supplementary Material (ESI) for Journal of Materials Chemistry


Supporting information

# One-step synthesis of metal nanoparticle decorated graphene by liquid phase exfoliation

Konghua Liu,[a] Lan Liu,[a]* Yuanfang Luo[a] and Demin Jia[a]

[a]Department of Material Science and Engineering, South China University of Technology, Guangzhou, 510641, P.R. China.

* Corresponding author

Corresponding E-mail: psliulan@scut.edu.cn

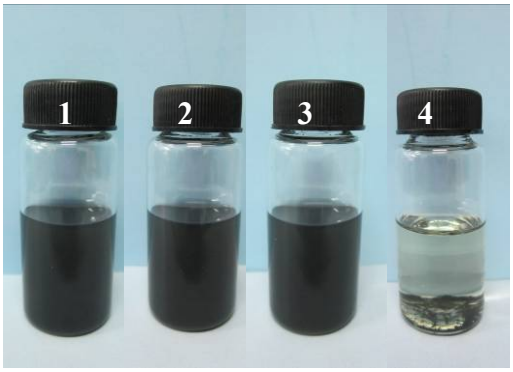


**Fig. S1** Photographs of graphite flakes dispersed in the acetonitrile solution taken 12 h after sonication (1), after centrifugation (2), after three weeks (3) and the dispersion of graphite in acetonitrile solution without addition of 2E4MZ-CN (4).

The dispersion has been sustained in the long term without distinguishable sedimentation at the bottom when 2E4MZ-CN is presented. Vial 4 shows that the dispersion of graphite in acetonitrile solution is poor when 2E4MZ-CN is absence.

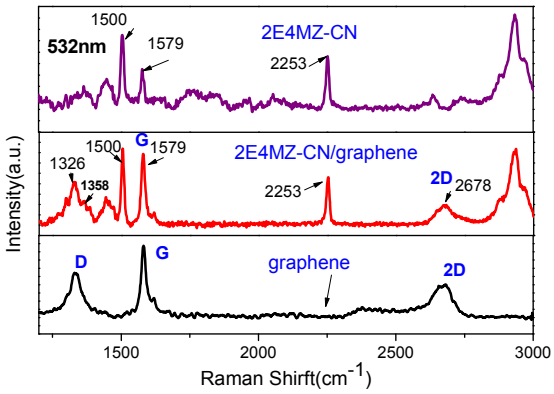


**Fig. S2** Raman spectra of 2E4MZ-CN, 2E4MZ-CN/graphene (unheated) and graphene (after heated)

The interaction between graphene and 2E4MZ-CN is also demonstrated by Raman spectra. For this Raman measurement, one sample was made by depositing the 2E4MZ-CN/graphene dispersion on Si substrate, and drying at room temperature. Another sample was made by depositing the 2E4MZ-CN/graphene dispersion on Si substrate, and heating at 400 °C for 2h under high vacuum. The ratio of 2D/G band is not seen to increase as the layer number decreases, which is usually observed in the case of mechanically exfoliated graphene. It is suggested that it was due to the chemical doping (hole- or electron-doping)[1,2] of 2E4MZ-CN to graphene which reduces the intensity of 2D band. When 2E4MZ-CN is presented in the sample for Raman measurement, the intensity of 2D band is low, nearly equaling to zero. The 2D band has a significant variation after the removal of 2E4MZ-CN by heating at 400°C for 2h.

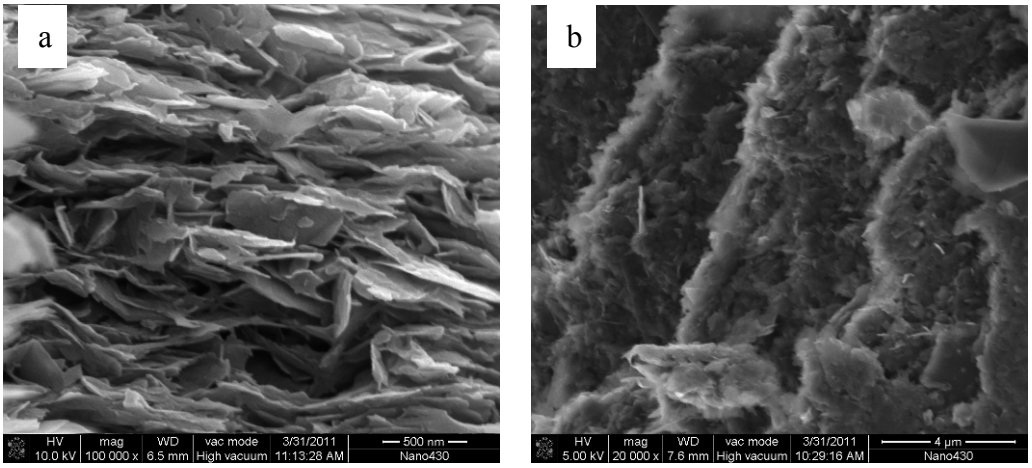


**Fig. S3** SEM image of cross section(a) and a crack on the surface (b) of as-prepared graphene film

Thin graphene film was prepared by vacuum-filtering graphene dispersion. The obtained film is porous and fragile. SEM cross section analysis shows while the graphene reaggregate to form the film, the flakes do not aggregate in an ordered way but small multilayers tend to restack randomly. SEM analysis of the surface shows the films to consist of graphene flakes well aligned in the plane of the film as reported in the literature[3].

## References

1 J. X. Geng, B. S. Kong, S. B. Yang and H. T. Jung, *Chem Commun.,* 2010, **46**, 5091.

2 C. N. R. Rao, K. Biswas, K. S. Subrahmanyam and A. Govindaraj, *J. Mater. Chem.,* 2009, **19**, 2457.

3 M. Lotya, P. J. King, U. Khan, S. De and J. N. Coleman, *ACS Nano.,* 2010, **4**, 3155.