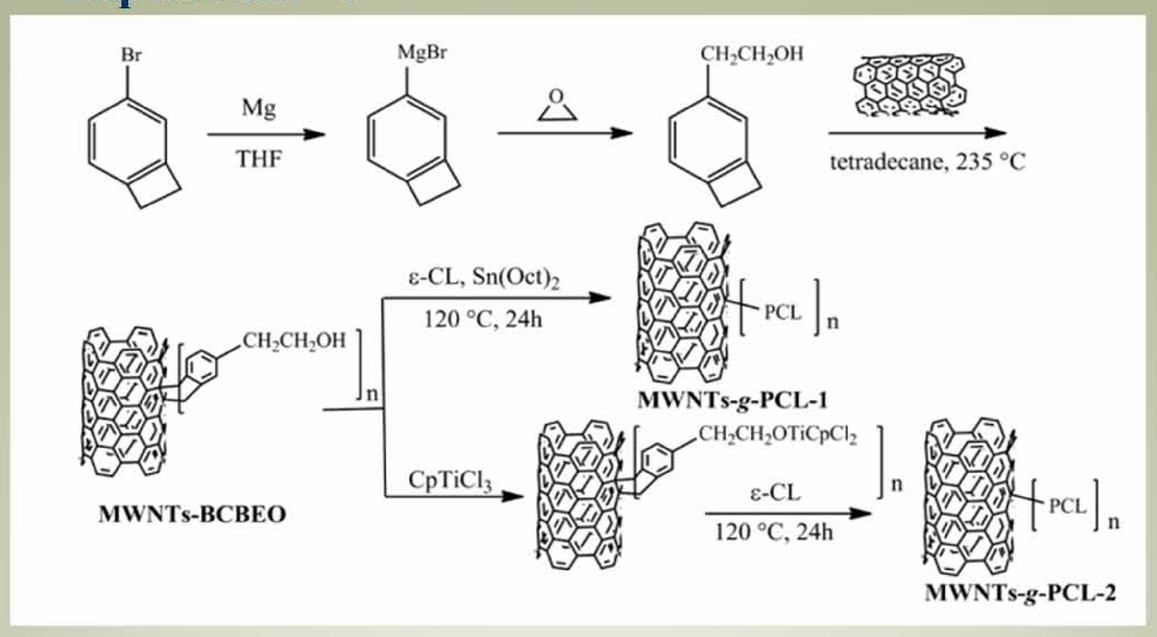
# Synthesis and crystallization behavior of PCL grafted on MWNTs with high grafting degrees

Zhou Bing(11129029), Xu Junting

MOE Key Laboratory of Macromolecular Synthesis and Functionalization, Department of Polymer Science and Engineering, Zhejiang University, Hangzhou 310027, China

**Introduction**: Carbon nanotubes (CNTs) have many extraordinary electronic, mechanical, thermal and chemical properties, while for the strong van de Waals interaction CNTs exhibit a tendency of aggregation. Covalently attaching poly (ε-caprolactone) (PCL) onto the surface of CNTs could greatly improve the dispersity of CNTs in some organic solvents. Because of the one-end fixation of PCL chains, the crystallization (both bulk and solution) behaviors have their unique characteristics.

## Experiment[1]:




Scheme 1 Covalent functionalization of MWNTs using a [4 + 2] Diels-Alder cycloaddition reaction.

## Results:

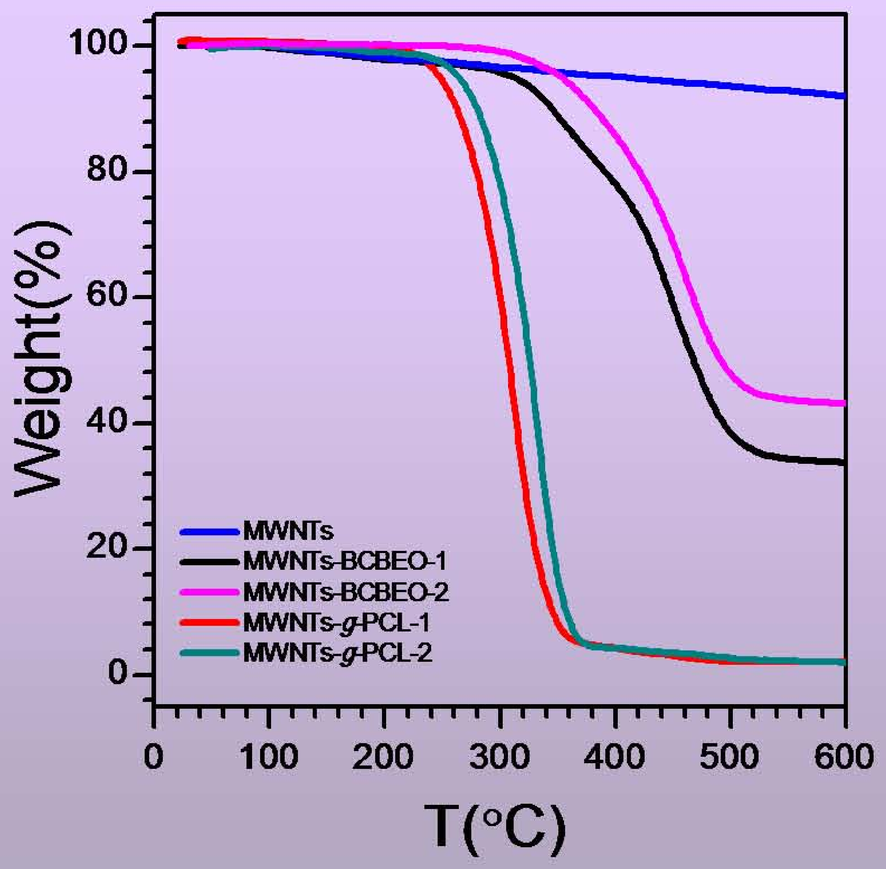



Figure 1 TGA curves of pristine MWNTs, MWNTs-BCBEOs and MWNTs-*g*-PCLs[2].

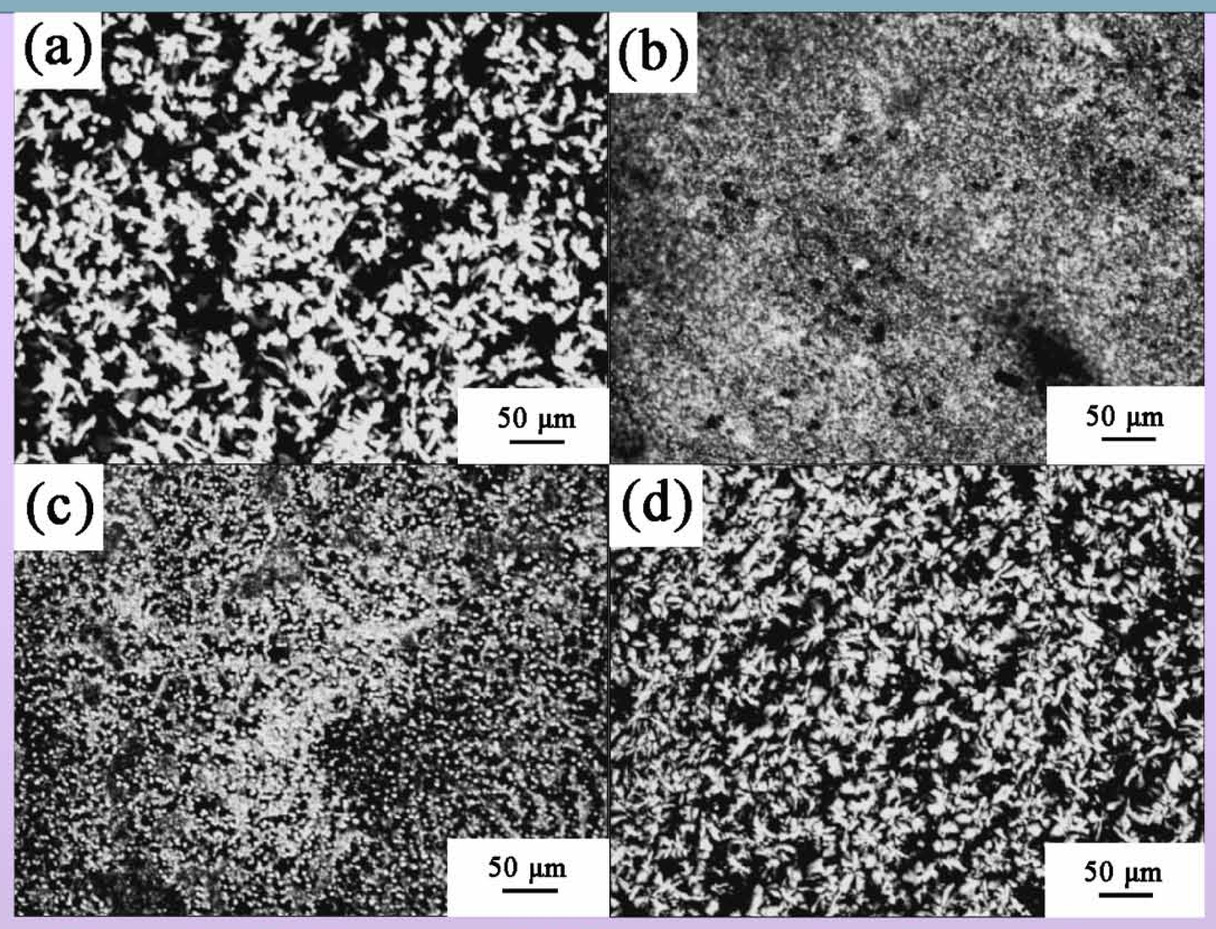



Figure 2 POM images of different samples after melting at 100 °C and then cooling to room temperature at a cooling rate of 2 °C/min. (a) neat PCL; (b) MWNTs-*g*-PCL-1; (c) MWNTs-*g*-PCL-2; (d) PCL/MWNTs blend.

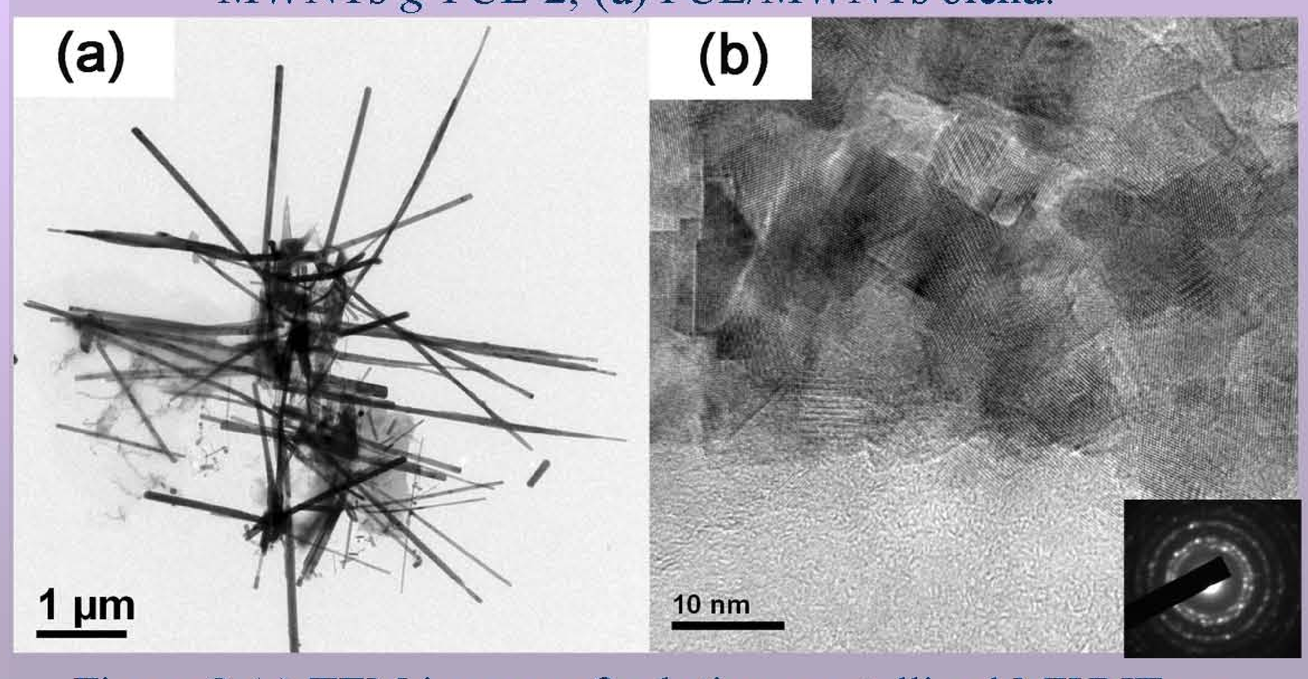



Figure 3 (a) TEM images of solution crystallized MWNTs-*g*-PCL, (b) HRTEM image of solution crystallized MWNTs-*g*-PCL and SAED of the same area.

## Conclusion:

1. A series of MWNTs-*g*-PCLs with high PCL grafting density were successfully synthesized.
2. Comparing with neat PCL and PCL/MWNTs blend, MWNTs-*g*-PCLs have much stronger heterogeneous nucleation, as well as some confinement effect during bulk crystallization.
3. In *n*-hexanol solution, PCL chains in MWNTs-*g*-PCLs could crystallize on the surface of MWNTs.

**Acknowledgement**:
This work was supported by national research program of china (973 program) (2011CB606005)

[1] D. Priftis, N. Petzetakis, G. Sakellariou, M. Pitsikalis, D. Baskaran, *Macromolecules* **2009**, 42, 3340.
[2] B. Zhou, Z.Z. Tong, J. Huang, J.T. Xu, Z.Q. Fan. *Mater Chem Phys*. **2013**, 137(3), 1053.