

Nano/micro structures formed by C₆₀ fullerene and (6,6)carbon nanobelts

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A carbon nanobelt (CNB) is composed of benzene rings. (see Figure 1) [1,2]. CNBs are rigid and electrons pass through the whole tubular structure. Cage structures composed of carbon atoms are called fullerenes. C₆₀ fullerene is a football shaped molecule formed by 60 carbon atoms and a very stable molecule (Figure 2) [3]. Several atoms have been intercalated into fullerenes.

In this study, we synthesise secondary structures formed by CNBs and C₆₀ molecules. First, those molecules are separately dissolved in 1,2-dichlorobenzene. Then, the two solutions were mixed and placed still for one week at room temperature. The structures of the nano materials produced in the solution are observed by a scanning electron microscope (SEM) (SU8030, Hitachi). The size of the materials is measured, targeting at 100 materials from the SEM images, whereas the hydrodynamic diameter of the materials by a Zetasizer (Nano-ZS, Malvern). The zeta potential of the materials is also measured by the Zetasizer.

We find that spherical particles are produced when the ratio of the molar concentration of CNBs to that of C₆₀ molecules is appropriately set at, noting that no structures are formed when CNBs and C₆₀ are individually dissolved in 1,2-dichlorobenzene. Amazingly, those particles are monodisperse in 1,2-dichlorobenzene, confirmed by the physical and hydrodynamic diameters of particles. What is more, they are also monodisperse in water. We will show and explain the details of the physical/chemical characteristics of the particles at the poster session.

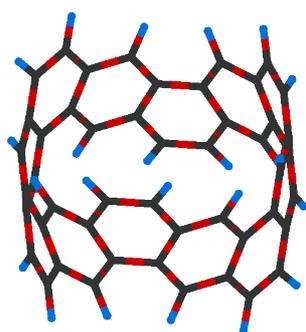


Figure 1. (6,6)carbon nanobelt.

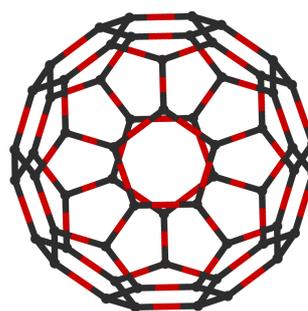


Figure 2. C₆₀ fullerene.

References:

- [1] G. Povie, Y. Segawa, T. Nishihara, Y. Miyauchi and K. Itami, Synthesis of a carbon nanobelt, *Science*. **356**, 172-175 (2017).
- [2] K.Y. Cheung, K. Watanabe, Y. Segawa and K. Itami, Synthesis of a zigzag carbon nanobelt, *Nat. Chem.* **13**, 255-259 (2021).
- [3] H.W. Kroto, J.R. Heath, S.C.O'Brien, R.F. Curl and R.E. Smalley, C₆₀: Buckminsterfullerene, *Nature* **318**, 162-163 (1985).