Design and Functions of Conjugated Sheet-shaped Macromolecules and Frameworks

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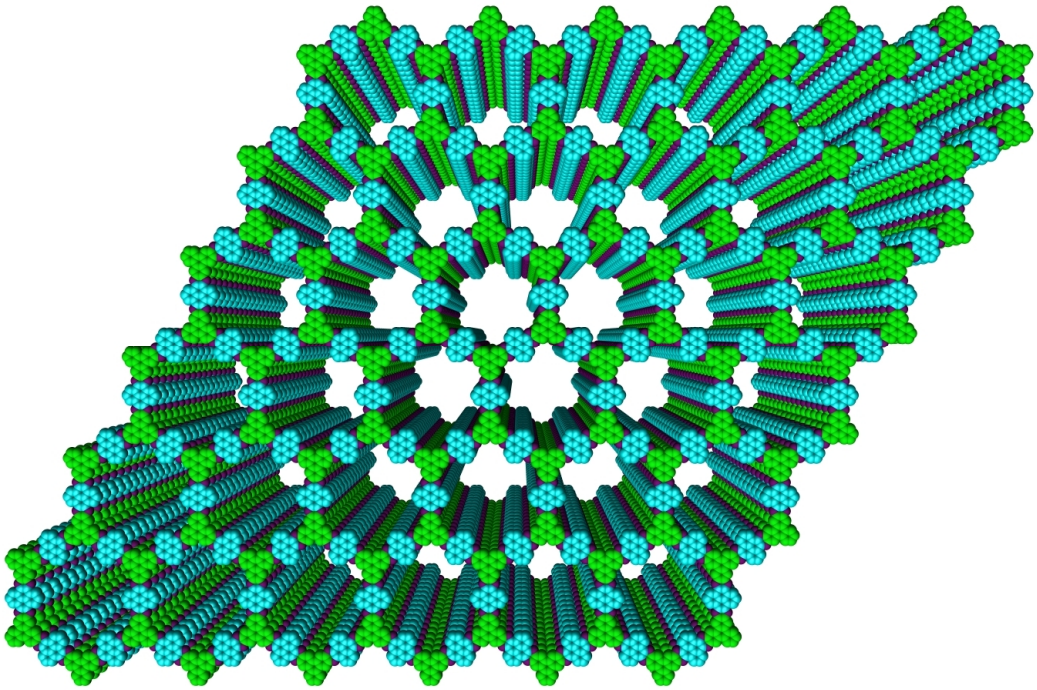
The need to develop inexpensive renewable energy sources stimulates scientific research for efficient, low-cost photovoltaic devices. Polymer-based photovoltaic devices exhibit great potential and application owing to their possibility of enabling large-area processing techniques. Usually, traditional linear polymers have low charge mobilities presumably because of weak interaction between 'slim' backbones. In this regard, two-dimensional flat sheet structure would be an ideal morphology from the viewpoint of maximizing intermolecular interactions, especially when all atoms are totally superimposed on those of neighboring sheet. This structure allows a broad path for charge carriers moving from one sheet to another.

Recently, we have succeeded in the synthesis of boronic-acid based sheet-shaped macromolecules and organic framework [1]. Here, we report a new family of sheet-shaped macromolecules and organic frameworks consisting of π-conjugated polymer structure. We have investigated the π-electronic functions including carrier mobility as well as their utilities in the assembling photofunctional modules for novel optoelectronics.



[1] Shun Wan, Jia Guo, Jangbae Kim, Hyotcherl Ihee, Donglin Jiang, "A Belt-Shaped, Blue Luminescent and Semiconducting Covalent Organic Framework", *Angew. Chem. Int. Ed.*, **2008**, 47, 8826 (VIP), highlighted by Chemical & Engineering News. Jyllian N. Kemsley, "Covalent Conducting Belts", *C & EN*, October 13, 2008 Volume 86, Number 41 P. 29.