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Self-Organized Structures of Amphiphilic Aromatic Amide Dendrons

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For a wide range of advanced technological materials, it is desirable, advantageous, and often necessary that hierarchical structures with functional groups can be precisely controlled from the molecular to the sub-micro- or micrometer regime. Progress in synthesis and characterization of self-organizing synthetic materials has been astounding, and dendritic molecules such as dendrimer, dendron, or hyperbranched polymers are an important class of them because they offer intriguing tunable built-in nanostructures and tailored properties by the simple molecular design. Herein, we report the self-organized hierarchical structures of the designed amphiphilic aromatic amide dendrons prepared by casting of the solution.

We synthesized a series of amphiphilic aromatic amide dendrons with hydrophilic triethylene oxide group and hydrophobic octadecyl groups from 1st to 3rd generations¹⁾. The characterization of the resulting dendrons was carried out by IR, ¹H-, ¹³C-NMR, MALDI-ToF MS spectroscopies. Molar masses of the dendrons obtained from MALDI-ToF MS spectra indicated a good agreement with that of the calculated one. Films were prepared from the solutions in chloroform or carbon disulfide on a variety of substrates such as glass slides and silicon wafers by casting at room temperature. From the observation of a scanning electron microscopy, we found that the 1st generation dendron forms the film which is composed of interwoven fibers with a diameter of sub-micrometers. On the other hand, such a fiber structure does not obtain from the 2nd and 3rd generation dendrons. When the films were prepared by casting under a moist air flow²⁾, the periodic microporous structure was obtained from the 2nd and 3rd generation dendrons over an area of 1 square centimeter. The diameters of the open pores on the surface were approximately 1~2 μm. The possible mechanism for the film formations and the characterization of the resulting films will be discussed in detail.

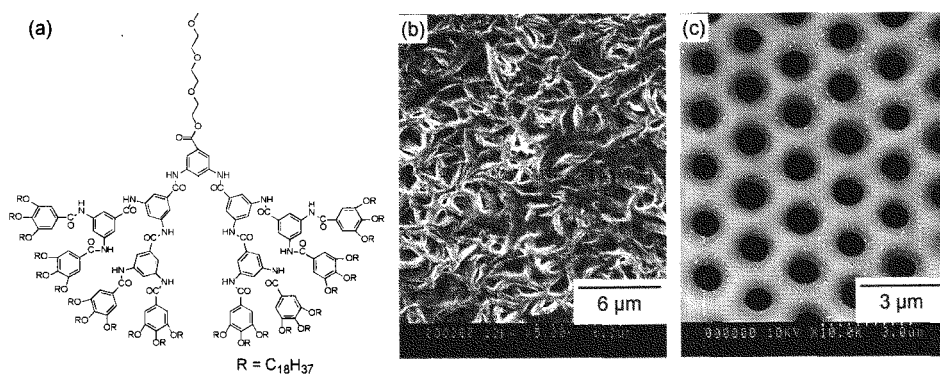


Figure 1. (a) Chemical structure of G3 amphiphilic aromatic amide dendron. (b) and (c) SEM images of cast films of the G1 and G3 dendron, respectively.

References

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