

Sub-5 nm Dendrimer Directed Self-assembly Using High Aspect Ratio Nanopatterns

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Directed self-assembly (DSA) of soft materials has been considered to be a significant method for producing highly periodic nanostructures. Among soft materials that can be handled by DSA techniques, supramolecules are attractive due to their advantageous properties such as small feature size (2-10 nm), various chemical functionalities, and fast stabilization time (~ mins) to self-assembly. This study exhibits long range planar ordering of supramolecular structures, especially dendrimer columns, over large-area with DSA techniques. Planar ordering of dendrimer columns that have small diameter (~ 4.75 nm) was generated on macroscopic area by topographical patterns that have high resolution (~ 20 nm) and high aspect ratio (> 10). According to the theoretical and experimental studies, geometrical anchoring and physical surface anchoring have a role to determine the alignment direction of dendrimer columns. These approaches demonstrate the important steps to produce highly periodic sub-5 nm nanostructures based on DSA of supramolecular structures.