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(54) **SUPRAMOLECULAR ASSEMBLIES AND BUILDING BLOCKS**

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C07F 1/00 (2006.01)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,648,508	A	7/1997	Yaghi
6,624,318	B1	9/2003	Mueller et al.
6,893,564	B2	5/2005	Mueller et al.
6,929,679	B2	8/2005	Muller et al.
6,930,193	B2	8/2005	Yaghi et al.
6,965,026	B2	11/2005	Zaworotko et al.
7,169,957	B2	1/2007	Atwood et al.
7,196,210	B2	3/2007	Yaghi et al.
7,279,517	B2	10/2007	Mueller et al.
2003/0222023	A1	12/2003	Mueller et al.
2006/0287190	A1	12/2006	Eddaoudi et al.
2008/0040984	A1	2/2008	Lanahan

OTHER PUBLICATIONS

Liu et al., Chem. Eur. J., vol. 13, pp. 8953-8959 (2007).*
Nouar et al., "Supermolecular Building Blocks (SBBs) for the Design and Synthesis of Highly Porous Metal-Organic Frameworks," J. Am. Chem. Soc. 2008, 130, 1833-1835.
Yang Zou et al., "A Designed Metal-Organic Framework Based on a Metal-Organic Polyhedron," Chem. Commun. 2008, 2340-2342.
Brandt J. et al., "Single-Metal-Ion-Based Molecular Building Blocks (MBBs) Approach to the Design and Synthesis of Metal-Organic Assemblies," J. Mol. Struct. 2006, 796, 160-164.
Cairns, A. et al., "Supermolecular Building Blocks (SBBs) and Crystal Design: 12-Connected Open Frameworks Based on a Molecular Cubohemioctahedron," J. Am. Chem. Soc. 2008, 1560-1561, 130.
Caulder, D. et al., "Supermolecules by Design," Acc. Chem. Res. 1999, 32, 975-982.
Cheetham A. et al., "Open-Framework Inorganic Materials," Agnew Chem., Int. Ed. 1999, 38, 3268-3292.

(Continued)

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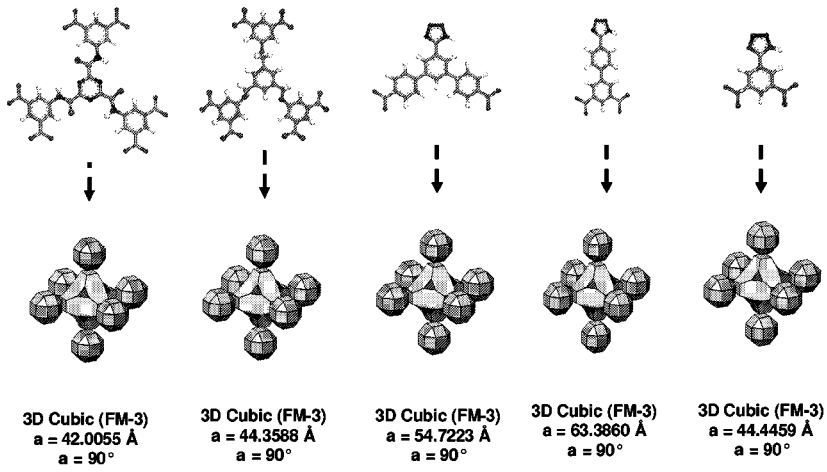
(57) **ABSTRACT**

The present invention generally relates to supramolecular assemblies and their modes of synthesis. The supramolecular assemblies include a 1:8 ratio of a supermolecular polyhedral building block and a triangular molecular building block, the supermolecular polyhedral building block having points of extension corresponding to the vertices of a rhombicuboctahedron for linking the supermolecular polyhedral building block to the triangular building block.

31 Claims, 16 Drawing Sheets