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**MacGillivray et al.**(10) **Patent No.:** **US 7,481,866 B2**  
(45) **Date of Patent:** **Jan. 27, 2009**(54) **GAS STORAGE MATERIALS AND DEVICES**(75) Inventors: **Leonard R. MacGillivray**, Iowa City, IA (US); **Giannis S. Papaefstathiou**, Ilioupoli Attikis (GR)(73) Assignee: **University of Iowa Research Foundation**, Iowa City, IA (US)

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(51) **Int. Cl.**  
**B01J 20/22** (2006.01)  
**C01B 3/00** (2006.01)(52) **U.S. Cl.** ..... **95/90; 502/401**(58) **Field of Classification Search** ..... 96/108;  
95/90, 116, 127, 130, 138, 141, 142, 143;  
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See application file for complete search history.

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The invention provides a porous metal-organic framework that can be used to store gases, such as hydrogen. Also provided is metal-organic framework comprising bifunctional metallic bridging groups and organic nodes having three or more points of connection, wherein the framework has one or more cavities suitable for containing one or more storage gas molecules. The invention further provides a metal-organic framework comprising organic functional groups directed into the one or more cavities that are capable of reacting with a storage gas.

**41 Claims, 8 Drawing Sheets**