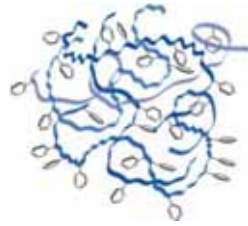
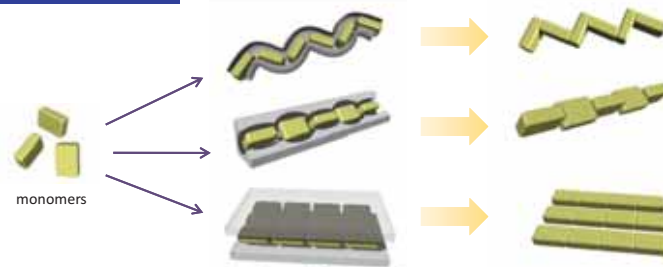


## ナノチャンネルで高分子をつくる



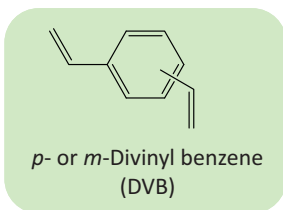
絡みあったポリマー鎖分子

ナノサイズの反応容器

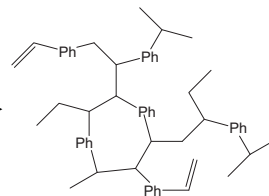


Controlled polymerization with constrained geometries

### Selective Polymerization of Multi-Polymerizable Monomers

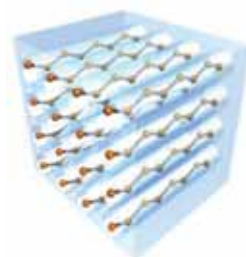


マクロ反応容器




架橋した不溶の物質

ナノチャンネル




Angew. Chem. Int. Ed. 2007, 46, 4987.

**PCP catalysis for Polymer Synthesis and Reactions**




*Angew. Chem. Int. Ed.* 2006.  
*Angew. Chem. Int. Ed.* 2008.  
*Chem. Mater.* 2009.  
*J. Mater Chem.* 2011.

**Fabrication of Nanosized Inorganic Polymers**



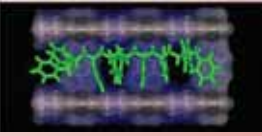
*J. Am. Chem. Soc.* 2008.  
*Chem. Mater.* 2011.

**Controlled Radical Polymerizations**




*Chem. Commun.* 2005.  
*Angew. Chem. Int. Ed.* 2007.  
*Macromolecules* 2008.  
*Chem. Lett.* 2008.  
*J. Am. Chem. Soc.* 2010.  
*Macromolecules* 2011.

**Unique Behaviors of Nanoconfined Polymers**



*J. Am. Chem. Soc.* 2008.  
*Nature Commun.* 2010.  
*Chem. Commun.* 2011.  
*Dalton Trans.* 2012.

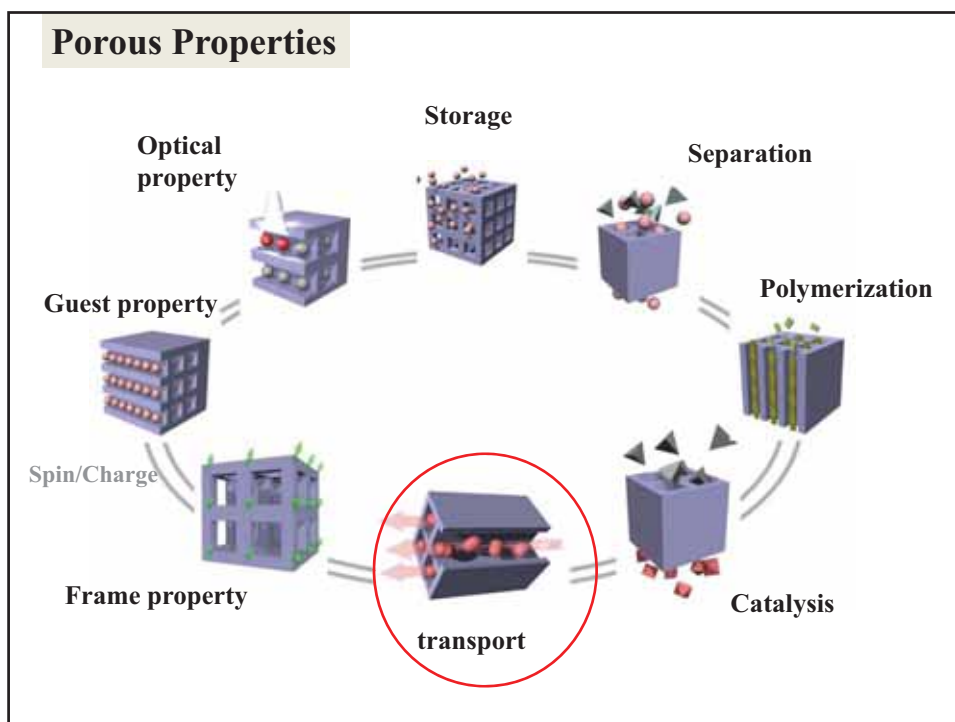
**Responsive Nanohybrids**

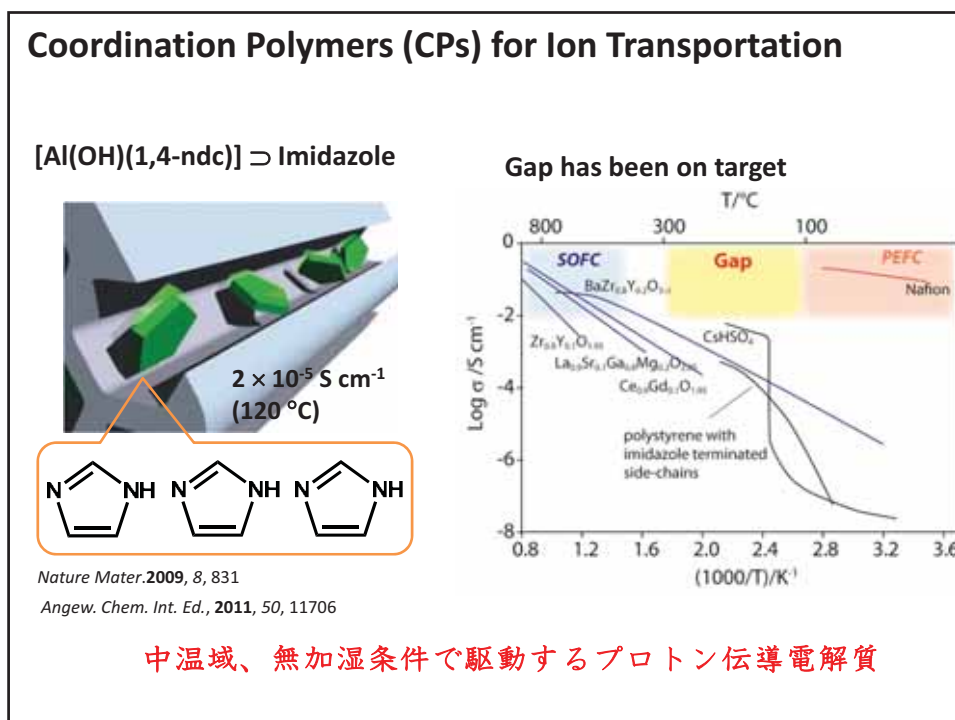
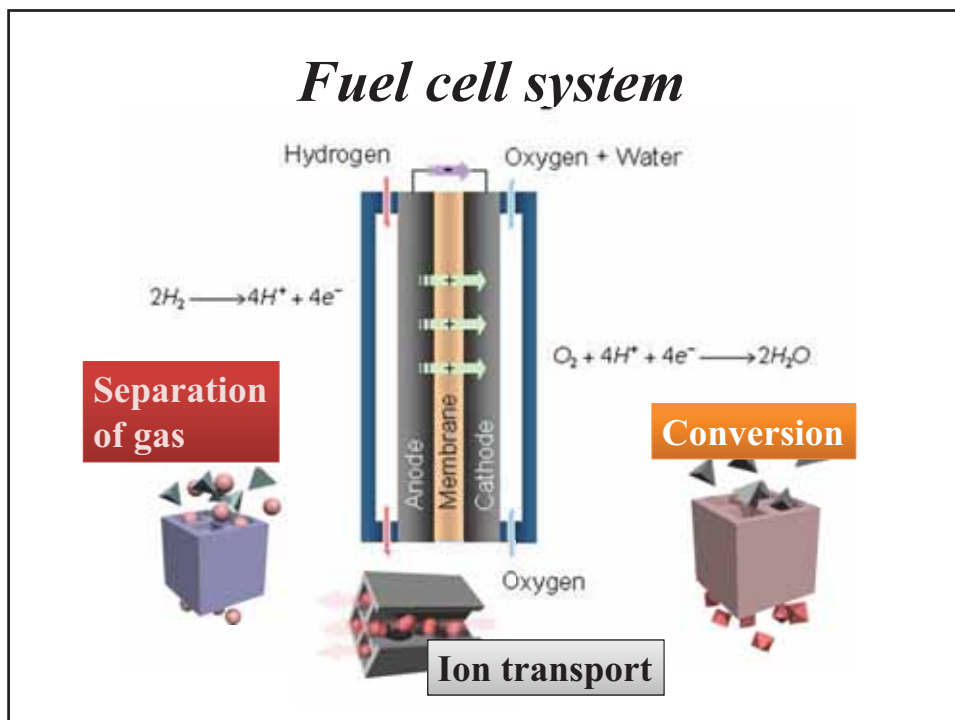


*Nature Mater.* 2011.  
*J. Am. Chem. Soc.* 2012.

**CHEMISTRY  
AN ASIAN JOURNAL**

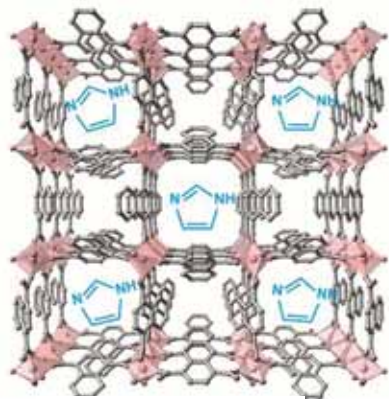
**Reviews:**  
*Chem. Asian J.* 2006.  
*Chem. Soc. Rev.* 2009.  
*Top. Curr. Chem.* 2010.  
*Bull. Chem. Soc. Jpn.* 2011.





Anhydrous Proton Conductors by post modification  
- nanocomposite conductors -

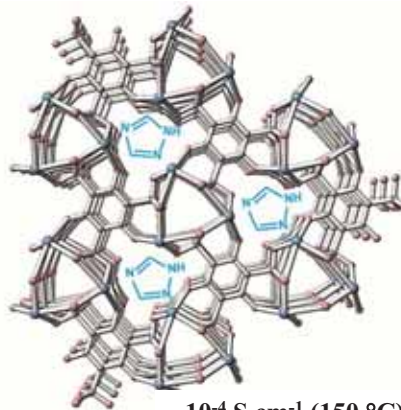
[Al(ndc)(OH)] + imidazole



$\sim 10^{-5} \text{ S cm}^{-1}$  (120 °C)

*Nature Mater.* 2009, 8, 831.

[Na<sub>3</sub>(thbts)] + triazole



$\sim 10^{-4} \text{ S cm}^{-1}$  (150 °C)

G. Shimizu., *Nature Chem.* 2009, 1, 705.

PCPを使った電解質材料の特長



湿度なし、100～  
300°Cで作動する



錯体ポリマー  
電解質

水など溶剤  
に溶けにくい

イオン伝導時に  
体積変化がない

有機ポリマーのように  
成形加工が可能

- 課題: 1)  $10^{-2} \sim 10^{-1} \text{ S/cm}$ の伝導度  
2) 数百～数十nmの均一な膜の作成  
3) 化学的・熱的安定性

