

中国科学院大连化学物理研究所
优秀博士后奖励基金申请表

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研究组: 506 组

学科专业: 物理化学

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	2015 年 12 月至今	Dalian Institute of chemical physics, China		Post doc. with Prof. Qihua Yang

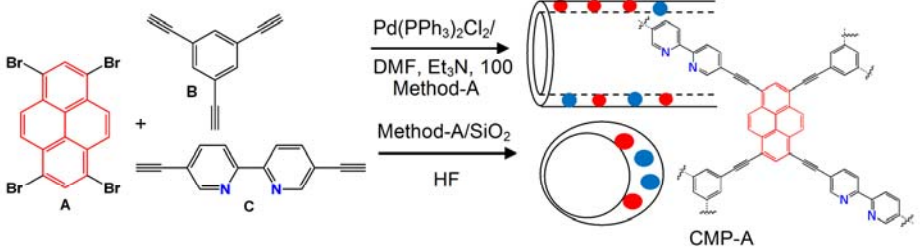
	博士论文题目	Designing The Functional Building Blocks For Syntheses Of Organic And Organic-Inorganic Hybrid Porous Materials
	指导教师姓名	Prof. Asim Bhaumik
博士学位论文摘要	<p>(限 800 字)</p> <p>The research embodied in the present thesis entitled “Designing The Functional Building Blocks For Syntheses Of Organic And Organic-Inorganic Hybrid Porous Materials” deals with synthesis and characterization of several novel nanoporous organic and hybrid organic inorganic materials and their applications in the field of gas adsorption and storage, heterogeneous catalysis, ion-exchange, chromatography and so on. Template directed synthesis of phloroglucinol diimine functionalized pore wall has been developed and showed as outstanding catalytic support for metal mediated catalysis. Further, surfactant templating approach for allylic polymerization of Triazine based monomer for the formation of pure organic polymer with hexagonal arrangement of mesopores has been shown to have excellent scaffold for metal mediated catalysis. On the other hand porphyrin functionalized pure organic polymers are synthesized which act as good sorbent for adsorption and storage of CO₂; thereby largely contributes to curb global pollution. The thesis has been presented in eight chapters.</p> <p>Chapter 3 illustrates the synthesis of hexagonal ordered phloroglucinol diimine functionalized periodic mesoporous organosilica (LHMS-3). Pd-LHMS-3 showed excellent catalytic activity and trans-selectivity in Heck C–C bond formation reactions for the synthesis of a series of value-added aromatic and aliphatic olefins.</p> <p>Chapter 4 reports about the synthesis of ‘Triazine’ functionalized hexagonal ordered organic polymer via organic-organic radical polymerization of 2,4,6-triallyloxy-1,3,5-triazine (TAT) in aqueous medium in the presence of an anionic surfactant (sodium dodecyl sulfate) as template. For several C-C cross coupling reactions. Pd-MPTAT shows high reusability for such catalysis.</p> <p>Chapter 5 describes the unique strategy (extended aromatic electrophilic substitution of porphyrin chemistry) for the synthesis of iron containing porous organic polymers containing porphyrin and metalloporphyrin ring. Porphyrin functionalized high surface area organic polymers (Fe-POP-1, Fe-POP-2 and Fe-POP-3) possess outstanding CO₂ storage ability at low pressure (19 wt%, 1 atm).</p> <p>Chapter 6 delineates the synthesis of Titanium grafted periodic mesoporous organosilica matrix (Ti-LHMS-3). Presence of Ti promotes the activation of olefins in presence of tertiary butylhydroperoxide for the formation of epoxides.</p> <p>Chapter 7 deals with the synthesis of palladium grafted periodic mesoporous organosilica (Pd-LHMS-3) for several C-C cross coupling reactions and cyanation reactions. This include Fluoride free Hiyama cross coupling reactions between aryl halides and aryl silane, Cu free Sonogashira cross coupling reactions between aryl halides and terminal alkynes and cyanation of aryl halides in presence of K₄[Fe(CN)₆] as non-toxic cyanide source. Pd-LHMS-3 shows high activity than mesoporous silica and can be reused for many cycles without being affected in catalysis.</p>	

入 站 前 期 科 研 情 况 简 介	1、主持或参与项目情况:					
	序号	项目名称	项目来源	项目金额	起止年度	角色
	2、论文发表情况:					
	序号	论文题目	期刊名	影响因子	发表年度/卷期/页码	排序
	1	A new periodic mesoporous organosilica containing diimine-phloroglucinol, Pd(II)-grafting and its excellent catalytic activity and trans-selectivity in C–C coupling reactions.	J. Mater. Chem.	6.626	2010, 20, 8099	1
	2	A novel mesoporous silica-grafted organocatalyst for the Michael addition reaction, synthesized via the click method	Green chem.	8.02	2011, 13, 586	2
	3	Triazine functionalized ordered mesoporous polymer: a novel solid support for Pd-mediated C–C cross-coupling reactions in water.	Green chem.	8.02	2011, 13, 1317	1
	4	Facile C–S coupling reaction of aryl iodide and thiophenol catalyzed by Cu-grafted furfural functionalized mesoporous organosilica.	Dalton Trans.	4.197	2011, 40, 5228	2
	5	Highly efficient mesoporous base catalyzed Knoevenagel condensation of different aromatic aldehydes with malononitrile and subsequent noncatalytic Diels–Alder reactions.	J. Mol. Catal. A: Chem.	3.615	2011, 335, 236	2
6	Novel Organic-Inorganic Hybrid Mesoporous Silica Supported Oxo-Vanadium Schiff Base for Selective Oxidation of Alcohols.	Adv. Synth. Catal.	5.663	2011, 353, 1897	3	
7	One-pot efficient Heck coupling in water catalyzed by palladium nanoparticles tethered into mesoporous organic polymer.	J. Mol. Catal. A: Chem.	3.615	2011, 350, 40	2	

8	Phloroglucinol derivatives as potential anti-ulcer compound that inhibits matrix metalloproteinase-9	International Journal of Pharmaceutical Applications	0.82	2011, 2, 237	2
9	Porphyrin based porous organic polymers: novel synthetic strategy and exceptionally high CO ₂ adsorption capacity.	Chem. Commun.	6.834	2012, 48, 248	1
10	One-pot thioetherification of aryl halides with thiourea and benzyl bromide in water catalyzed by Cu-grafted furfural imine functionalized mesoporous SBA-15	Chem. Commun.	6.834	2012, 48, 8000	2
11	Pd-grafted periodic mesoporous organosilica: an efficient heterogeneous catalyst for Hiyama and Sonogashira coupling, and cyanation reaction	Green chem.	8.02	2012, 14, 2840	1
12	Triazine functionalized ordered mesoporous organosilica as a novel organocatalyst for the facile one-pot synthesis of 2-amino-4H-chromene under solvent-free conditions.	RSC Advances	3.84	2012, 2, 11306.	2
13	Functionalized mesoporous materials as efficient organocatalysts for the syntheses of xanthenes	J. Mol. Catal. A: Chem.	3.615	2012, 363, 254	3
14	Titanium containing periodic mesoporous organosilica as an efficient catalyst for the epoxidation of alkenes.	Catalysis today	3.893	2012, 198, 45	1
15	Porphyrin Based Porous Organic Polymer Supported Iron (III) Catalyst for Efficient Aerobic Oxidation of 5-hydroxymethylfurfural into 2,5-furandicarboxylic acid.	Journal of Catalysis	6.921	2013, 299, 316.	4
16	Highly porous organic polymer: A convenient carbocatalyst for indole C-H activation at room temperature.	ChemCatChem	4.556	2013, 5, 1749	1

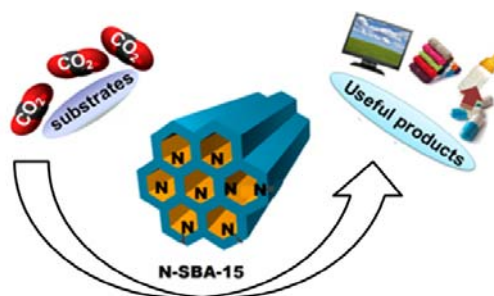
17	Porphyrin based porous organic polymer for bifunctional catalyst for selective oxidation and Knoevenagel condensation reactions.	Applied Catalysis A: General	3.942	2013, 459, 41.	1
18	Pd-anchored functionalized mesoporous materials as robust and recyclable heterogeneous catalyst for a series of C-C bond formation reactions.	Recyclable Catalysis	-	2013, 1, 10	3
19	A Luminescent nanoporous hybrid material based drug delivery system showing excellent theranostics potential for cancer	Chem.Commun.	6.834	2013, 49, 7644	1
20	Cu-grafted functionalized mesoporous SBA-15: A novel heterogeneous catalyst for facile one-pot three component C-S cross coupling reaction of Aryl halides in water.	Org.ProcessRes. Dev.	2.53	2014, 18(1), 257.	3
21	Triazine functionalized porous organic polymer: Excellent CO ₂ storage material and support for designing Pd nanocatalyst for C-C cross coupling reactions.	J. Mater. Chem. A	7.443	2014, 2, 11642	1
22	Porous carbon derived via KOH activation of a hypercrosslinked porous organic polymer for efficient CO ₂ , CH ₄ , H ₂ adsorption and high CO ₂ /N ₂ selectivity.	Journal of Solid State Chemistry	2.133	2015, 232, 157-162	1

23	Synthesis of 9,9'-Spirobifluorene-Based Conjugated Microporous Polymers by FeCl ₃ -mediated Polymerization.	Polymer Chemistry	5.52	2016, 7, 1290-1296.	1
24	High-throughput Acid-Base Tandem Organocatalysis over Hollow Tube-Shaped Porous Polymers and Carbons	Chemistry Select (Willey-VCH), Accepted, 2016 (slct.201600239R1)	-	April, 2016	1
25	Photocatalytic H ₂ Evolution by Pt-Loaded 9,9'-Spirobifluorene-based Conjugated Microporous Polymers under Visible Light Irradiation	Bulletin of the Chemical Society of Japan, 2016 (BCSJ-2016-0105; Accepted)	2.21	April, 2016	1
3、专利情况:					
序号	专利名称	授权/申请	授权/申请号	起始日期	排序
4、获奖情况:					
序号	奖励名称	奖励等级	授奖单位	奖励年度	排序
1	Merit-Cum-Means scholarship	National	IIT-Kharagpur, India	2006	1
2	CSIR-NET in Chemical Science	National	Council of Scientific and Industrial Research, India	2007	1
3	Graduate Aptitude Test in Engineering (GATE) in chemical science	National	Indian Institute of science, Bangalore	2007	1
4	State Level Eligibility Test (SET) for lecturer-ship in India	State level	SET-Govt. of West Bengal, India	2007	1
5	Visiting Researcher Travel Grant	International	Toyota central R & D Lab. Inc. Japan	2013	1

6	Advanced carbon transformation (ACT-C) project, Japan	International	Toyota central R & D Lab. Inc. Japan	2013	1
<p>博士后研究题目：Heterogeneous catalysis, CO₂ adsorption with functionalized porous polymers and carbon</p>					
<p>(简述研究计划的可行性、先进性和创新性，理论和现实意义)</p>					
<p>Biological photosynthesis is highly inspiring regarding harvesting solar spectrum to chemical energy. Inorganic semiconductors are frequently being used as an energy transducers, mostly worked in ultraviolet (UV) and to some extent in near visible light.^[1] Due to the availability of solar energy, visible light promoted photoreactions can be designed through an affordable, cost-effective way.</p>					
<p>Organic polymers having diversity in synthesis, adaptable band-gap property, can be intriguing, although still remains unexplored. Adequate tuning in optical band-gap sometimes fruitful in harvesting visible light >580 nm, commonly observed as characteristics for conjugated microporous polymers (CMP).^[2,3] Thus, without any doubt, CMPs have immense prospect for further advancement in this area. However, owing to the nature of bulky organic species, it would be quite difficult to control the nanoarchitectures of porous polymers together with surface and electronic properties.</p>					
<p>Therefore, a bipyridine-pyrene based organic photosensitizer has been proposed.</p>					
<p>(A) Pd-catalyzed Sonogashira cross coupling is an efficient platform for making a conjugated polymer comprising bipyridine-pyrene framework. Unlike others polymers, CMP-A might possess nanorods or nanosphere morphology. Bipyridine moiety in CMP-A could facilitate metal binding along with pyrene as photosensitizer.</p>					
					
<p>Scheme 1. Representation for polymer-based photosensitizer</p>					

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(B) CO₂ conversion to valuable fine chemicals has been envisaged through N-doped SBA-15 as basic organocatalyst. Furthermore, N-sites could be exploited for adsorption of high quantity of CO₂ from a mixture of CO₂, N₂, H₂O regarding purification of fuel gases.



Reference:

- [1] S. S. Mao et al. *Chem. Rev.* 2010, 110, 6503.
- [2] U. Scherf et al. *Acc. Chem. Res.* 2008, 41, 1086.
- [3] A. I. Cooper *Adv. Mater.* 2009, 21, 1291.

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本人承诺：申请表所填内容均真实可靠。对因虚报、伪造等行为引起的后果及法律责任均由本人承担。

本人签字：

年 月 日

博士后合作导师考核推荐表

对申请人学术水平、科研能力等方面的考核意见：

对申请人提出的研究计划的评价（如可行性、先进性、创新之处、理论和实用意义）：

推荐意见（是否同意推荐申请优秀博士后奖励基金）：

合作导师签字

年 月 日