

江 東 林 (准教授) (2005年5月1日 ~ 2015年12月31日)*)

A-1) 専門領域：有機化学，高分子科学

A-2) 研究課題：

- a) 2次元高分子の創生と機能開拓
- b) 多孔性共役高分子の創出と機能開拓

A-3) 研究活動の概略と主な成果

- a) 新奇な2次元高分子の合成および新しい機能の開拓に成功した。三角形トポロジーを有する2次元高分子を合成し，超高密度電子系を構築した (*Nat. Commun.* 2015)，化学的に安定な2次元高分子を合成し，有機触媒機能を開拓した (*Nat. Chem.* 2015)，2次元高分子の蓄電機能 (*Angew. Chem., Int. Ed., Sci. Rep.* 2015)，CO₂貯蔵機能 (*J. Am. Chem. Soc., Angew. Chem., Int. Ed.* 2015)，電荷分離機能 (*J. Am. Chem. Soc.* 2015) および光応答機能 (*Angew. Chem., Int. Ed.* 2015) を明らかにした。
- b) 多孔性共役高分子に関して，薄膜作製手法の確立 (*Angew. Chem., Int. Ed.* 2015) と新規な機能発現に成功した。光捕集アンテナ機能 (*Sci. Rep.* 2015)，高蛍光性機能 (*Angew. Chem., Int. Ed.* 2015)，光電変換機能 (*Angew. Chem., Int. Ed.* 2015)，触媒機能 (*Sci. Rep.* 2015) を開拓した。

B-1) 学術論文

C. GU, N. HUANG, Y. CHEN, L. QIN, H. XU, S. ZHANG, F. LI, Y. MA and D. JIANG, “ π -Conjugated Microporous Polymer Films: Designed Synthesis, Conducting Properties and Photoenergy Conversions,” *Angew. Chem., Int. Ed.* **54**, 13594–13598 (2015). (Hot Paper)

X. CHEN, M. ADDICOAT, E. JIN, H. XU, T. HAYASHI, F. XU, N. HUANG, S. IRLE and D. JIANG, “Designed Synthesis of Double-Stage Two-Dimensional Covalent Organic Frameworks,” *Sci. Rep.* **5**, 14650 (2015).

H. XU, J. GAO and D. JIANG, “Stable, Crystalline, Porous, Covalent Organic Frameworks As A Platform for Chiral Organocatalysis,” *Nat. Chem.* **7**, 905–912 (2015). (Highlighted by Chemistry World, Chemeurope.Com., Phys.Org. and Synthlett, Press release by IMS)

C. GU, N. HUANG, Y. WU, H. XU and D. JIANG, “Design of AIE-Based Highly Photofunctional Porous Polymer Films with Controlled Thickness and Prominent Microporosity,” *Angew. Chem., Int. Ed.* **54**, 11540–11544 (2015).

S. DALAPATI, M. ADDICOAT, S. JIN, T. SAKURAI, J. GAO, H. XU, S. IRLE, S. SEKI and D. JIANG, “Rational Design of Crystalline Supermicroporous Covalent Organic Frameworks with Triangular Topologies,” *Nat. Commun.* **6**, 7786 (2015).

X. CHEN, J. GAO and D. JIANG, “Designed Synthesis of Porphyrin-Based Two-Dimensional Covalent Organic Frameworks with Highly Ordered Structures,” *Chem. Lett.* **44**, 1257–1259 (2015).

N. HUANG, R. KRISHNA and D. JIANG, “Tailor-Made Pore Surface Engineering in Covalent Organic Frameworks: Systematic Functionalization for Performance Screening,” *J. Am. Chem. Soc.* **137**, 7079–7082 (2015).

- S. JIN, M. SUPUR, M. ADDICOAT, K. FURUKAWA, L. CHEN, T. NAKAMURA, S. FUKUZUMI, S. IRLE and D. JIANG**, “Creation of Superheterojunction Polymers via Direct Polycondensation: Segregated and Bicontinuous Donor-Acceptor π -Columnar Arrays in Covalent Organic Frameworks for Long-Lived Charge Separation,” *J. Am. Chem. Soc.* **137**, 7817–7827 (2015).
- N. HUANG, X. DING, J. KIM, H. IHEE and D. JIANG**, “A Photoresponsive Smart Covalent Organic Framework,” *Angew. Chem., Int. Ed.* **54**, 8704–8707 (2015). (VIP)
- Y. WU, J. GAO and D. JIANG**, “ π -Electronic Covalent Organic Framework Catalyst: π -Walls as Catalytic Beds for Diels-Alder Reactions Under Ambient Conditions,” *Chem. Commun.* **51**, 10096–10098 (2015). (Front Cover)
- F. XU, H. XU, X. CHEN, D. WU, Y. WU, H. LIU, C. GU, R. FU and D. JIANG**, “Radical Covalent Organic Frameworks: A General Strategy to Immobilize Open-Accessible Polyradicals and High-Performance Capacitive Energy Storage,” *Angew. Chem., Int. Ed.* **54**, 6814–6818 (2015).
- X. CHEN, M. ADDICOAT, E. JIN, L. ZHAI, H. XU, N. HUANG, Z. GUO, L. LIU, S. IRLE and D. JIANG**, “Locking Covalent Organic Frameworks with Hydrogen Bonds: General and Remarkable Effects on Crystalline Structure, Physical Properties, and Photochemical Activities,” *J. Am. Chem. Soc.* **137**, 3241–3247 (2015).
- C. GU, N. HUANG, F. XU, J. GAO and D. JIANG**, “Cascade Exciton-Pumping Engines with Manipulated Speed and Efficiency in Light-Harvesting Porous π -Network Films,” *Sci. Rep.* **5**, 8867 (2015).
- F. XU, S. JIN, H. ZHONG, D. WU, X. YANG, X. CHEN, H. WEI, R. FU and D. JIANG**, “Electrochemically Active, Crystalline, Mesoporous Covalent Organic Frameworks on Carbon Nanotubes for Synergistic Lithium Battery Energy Storage,” *Sci. Rep.* **5**, 8225 (2015).
- N. HUANG, X. CHEN, R. KRISHNA and D. JIANG**, “Two-Dimensional Covalent Organic Frameworks for Carbon Dioxide Capture via Channel-Wall Functionalization,” *Angew. Chem., Int. Ed.* **54**, 2986–2990 (2015).

B-4) 招待講演 (* 基調講演)

- D. JIANG**, “Porous Organic Films for Optoelectronic Applications,” The 7th International Symposium on Advanced Materials and Nanotechnology (AMN-7), Nelson (New Zealand), February 2015.* (Keynote Lecture)
- D. JIANG**, “Porous Polymer Nanofilms with AIE Skeletons,” The 2nd International Symposium on Aggregation-Induced Emission, Guangzhou (China), May 2015.
- D. JIANG**, “Two-Dimensional Polymers and Covalent Organic Frameworks,” The 13th International Conference on Polymer Advanced Technologies (PAT2015), Hangzhou (China), June 2015.
- D. JIANG**, “Two-Dimensional Polymers and Covalent Organic Frameworks,” 8th International Conference on Materials for Advanced Technologies (ICMAT2015), Singapore, June–July 2015.
- D. JIANG**, “Conjugated Microporous Polymers,” 8th International Conference on Materials for Advanced Technologies (ICMAT2015), Singapore, June–July 2015.
- D. JIANG**, “Covalent Organic Frameworks,” Commemorative Golden Jubilee Chemistry Conference, Singapore, August 2015.
- D. JIANG**, “Covalent Organic Frameworks for Electrochemical Energy Storage and Power Supply,” 250th American Chemical Society National Meeting, Boston (U.S.A.), August 2015.

D. JIANG, “Supramolecular Interactions as A Powerful Tool for the Structural Design and Functional Control of Covalent Organic Frameworks,” China NANO2015, Beijing (China), September 2015.

D. JIANG, “Two-Dimensional Covalent Organic Frameworks,” 1st International Symposium on Energy Chemistry and Materials, Fudan University, Shanghai (China), October 2015.* (Keynote lecture)

D. JIANG, “Covalent Organic Frameworks: A Platform for Crystalline Organic Optoelectronics,” 1st European Conference on Metal Organic Frameworks and Porous Polymers, Potsdam (Germany), October 2015.* (Keynote lecture)

D. JIANG, “Two-Dimensional Covalent Organic Frameworks for Challenging Energy Issues,” Pacificchem 2015, Honolulu (U.S.A.), December 2015.

B-6) 受賞, 表彰

江 東林, 2000年度日本化学会年次大会講演賞 (2000).

江 東林, 2005年度日本化学会若手特別講演賞 (2005).

江 東林, 2006年度高分子学会 Wiley 賞 (2006).

江 東林, 2006年度科学技術分野文部科学大臣表彰若手科学者賞 (2006).

B-7) 学会および社会的活動

学会の組織委員等

The Second International Symposium on Dendrimer, Local Organizing Committee (2000).

Winter School of JSPS Asian Core Program on Frontiers of Materials, Photo and Theoretical Molecular Science, Beijing, December 5–8, Co-Organizer (2006).

China-Japan Joint Symposium on the π -Conjugated Molecules towards Functional Materials, Beijing, February 24–25, Co-Organizer (2008).

Sokendai Asian Winter School “Molecular Sciences on Different Space-Time Scales,” Okazaki, December 9–12, Co-Organizer (2008).

China-Japan Joint Symposium on Functional Supramolecular Architecture, Beijing, December 20–21, Co-Organizer (2008).

Japan-China Joint Symposium on Functional Supramolecular Architecture, Hokkaido, August 2–5, Co-Organizer (2009).

Sokendai Asian Winter School “Molecular Sciences on Different Space-Time Scales,” Okazaki, December 2–5, Co-Organizer (2009).

China-Japan Joint Symposium on Functional Supramolecular Architecture, Jilin University, Changchun, July 25–28, Co-Organizer (2010).

China-Japan Joint Symposium on Functional Supramolecular Architecture, Beijing Normal University, Beijing, October 6–9, Co-Organizer (2011).

Japan-China Joint Symposium on Functional Supramolecular Architecture, IMS, Okazaki, Jan. 19–21, Co-Organizer (2013).

China-Japan Joint Symposium on Functional Supramolecular Architecture, Soochow University, Changchun, October 25–28, Co-Organizer (2013).

The 4th International Conference on Metal–Organic Frameworks and Open Framework Compounds, Kobe, September 28–October 2, Local Organizing Committee (2014).

China-Japan Joint Symposium on Functional Supramolecular Architecture, Tianjin University, December 10–14, Co-Organizer (2014).

Frontiers of Organic Porous Materials: Structures, Properties and Applications, Symposium 223 in Pacificchem 2015@ Hawaii, Honolulu, Co-Organizer (2015).

B-8) 大学での講義，客員

復旦大学高分子専攻, 「Advanced Porous Materials」, 2015年12月12日.

清華大学化学専攻, 「Two-Dimensional Polymers」, 2015年10月28日.

総合研究大学院大学物理科学研究科アジア冬の学校, 「Two-Dimensional Organic Frameworks Challenging for Energy Issues」, 2015年12月3日.

B-9) 学位授与

Hong XU, 「Design and Functions of Imine-Linked Covalent Organic Frameworks」, 2015年3月, 博士(理学)

Ning Huang, 「Design and Functions of Porous Organic Polymers」, 2015年9月, 博士(理学)

Yang Wu, 「Design, Synthesis, and Functionalization of π -Electronic Two-dimensional Covalent Organic Frameworks」, 2015年9月, 博士(理学)

B-10) 競争的資金

科学技術振興機構さきがけ研究「構造制御と機能領域」, 「樹木状金属集積体を用いたスピン空間の構築と機能開拓」, 江東林 (2005年–2008年).

科研費基盤研究(B), 「光・磁気スイッチング配位高分子の設計と機能」, 江東林 (2008年–2010年).

科学技術振興機構さきがけ研究「太陽光と光電変換機能領域」, 「シート状高分子を用いた光エネルギー変換材料の創製」, 江東林 (2009年–2012年).

科研費基盤研究(A), 「共役多孔性高分子による特異分子空間の創出と機能開拓」, 江東林 (2012年–2015年).

B-11) 産学連携

トヨタ自動車(株)共同研究, 「燃料電池電極触媒用カーボン担体の研究開発」, 江東林 (2015年).

日立化成(株)共同研究, 「耐熱性二次元高分子」, 江東林 (2015年).

C) 研究活動の課題と展望

二次元高分子の本質に迫る。

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