

JIAN HAO 郝健

Postdoctoral Researcher

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Personal profile

- PhD in Materials Chemistry and Physics, Institute of Coal Chemistry, Chinese Academy of Sciences, July 2020.
- Research interest: polymer-based carbon materials, Metal-Organic Framework (MOF) materials and membranes.
- Extensive background in PAN thermal stabilization process and PAN-based carbon fiber production, and synthesis of ZIF-8 membranes for gas separation.
- Strong problem-solving ability and desire to learn from different disciplines.

Research experience & Education:

Postdoctoral researcher, Chemical Engineering 2020.08 – present

École Polytechnique Fédérale de Lausanne (EPFL) – Sion, Switzerland

Advisor: Professor Kumar Varoon Agrawal

- Crystallization and defect engineering of ZIF-8 membranes for gas separation applications.

Visiting PhD student, Chemical Engineering 2019.03 – 2020.07

École Polytechnique Fédérale de Lausanne (EPFL) – Sion, Switzerland

Advisor: Professor Kumar Varoon Agrawal

- Continuous crystallization of MOF membrane for gas separation.
 - Developed a fast (8 min) and reproducible method to prepare defect-free, polycrystalline ZIF-8 membranes with superior gas separation performance.
- Restricting lattice flexibility in polycrystalline MOF membrane for carbon capture.
 - Improved carbon capture ability of ZIF-8 membranes to a great extent (CO₂/CH₄: ~30) by a rapid heat treatment (RHT) method.

PhD, Material Physics and Chemistry 2014.09 – 2020.07

Institute of Coal Chemistry, Chinese Academy of Sciences – Taiyuan, China

Advisor: Professor Yaodong Liu and Professor Chunxiang Lu

- The study on the effect of polyacrylonitrile (PAN) chemical structures on its stabilization and carbonization reactions.
 - Synthesized PAN copolymers with different sequence structures and studied their stabilization and carbonization reactions.
 - Prepared highly isotactic (>60%) PAN-based carbon fiber, and studied the effect of PAN stereoregularity on the carbon fiber production processes.

- Side projects during my PhD:
 - Prepared PAN-based carbon membrane by dip-coating method.
 - Studied solvent effects on the copolymerization of acrylonitrile and methyl acrylate by experimental method and computation software, Gaussian.
 - Compared the properties of PAN polymerized by different method including free-radical, suspension and emulsion polymerization.

B.E., Polymer Science and Engineering

2010.09 – 2014.06

Northeast Forestry University – Harbin, China

Advisor: Professor Zhenhua Gao

- Effect of EVA and PVF on the properties of soybean-based aqueous polymer isocyanate adhesives.

Publications:

1. **Hao J**, Babu D J, Liu Q, et al. Synthesis of high-performance polycrystalline metal-organic framework membranes at room temperature in a few minutes [J]. *Journal of Materials Chemistry A*, 2020, 8, 7633-7640. (JMCA HOT Papers & Journal back cover)
2. **Hao J**, Wei H, Lu C, et al. New aspects on the cyclization mechanisms of poly(acrylonitrile-co-itaconic acid) [J]. *European Polymer Journal*, 2019, 121: 109313.
3. **Hao J**, An F, Lu C, et al. Solvent effects on radical copolymerization of acrylonitrile and methyl acrylate: Solvent polarity and solvent-monomer interaction [J]. *Journal of Macromolecular Science, Part A*, 2019, 56(11): 1012-21.
4. **Hao J**, Li W, Suo X, et al. Highly isotactic (>60%) polyacrylonitrile-based carbon fiber: Precursor synthesis, fiber spinning, stabilization and carbonization [J]. *Polymer*, 2018, 157: 139-50.
5. **Hao J**, Liu Y, Lu C. Effect of acrylonitrile sequence distribution on the thermal stabilization reactions and carbon yields of poly(acrylonitrile-co-methyl acrylate) [J]. *Polymer Degradation and Stability*, 2018, 147: 89-96.
6. **Hao J**, An F, Yu Y, et al. Effect of coagulation conditions on solvent diffusions and the structures and tensile properties of solution spun polyacrylonitrile fibers [J]. *Journal of Applied Polymer Science*, 2017, 134(5): 44390.
7. Li W, **Hao J**, Zhou P, et al. Solvent-solubility-parameter-dependent homogeneity and sol-gel transitions of concentrated polyacrylonitrile solutions [J]. *Journal of Applied Polymer Science*, 2017, 134(41): 45405.
8. Babu D J, He G W, **Hao J**, et al. Restricting lattice flexibility in polycrystalline metal-organic framework membranes for carbon capture [J]. *Advanced Materials*, 2019, 31(28): 1900855.
9. He Q, Zhou P, **Hao J**, et al. Incorporation of alkali lignin in polyacrylonitrile: Phase separation, coagulation, and cyclization kinetics [J]. *ACS Omega*, 2019, 4(7): 11346-53.

Conference:

2nd International Carbon Materials Conference &Exposition, 2017.11, Beijing.

Strength:

- Good English skills. (IELTS 7.0)
- Expertise in the necessary software to process and present experimental data clearly (e.g., Origin, Endnote, ChemDraw, Photoshop, etc.).
- Proficiency in a wide range of characterization techniques (e.g., SEM, NMR, FTIR, UV-Vis, XRD, TGA, DSC, DMA, GPC, Rheometry).

Hobbies:

Basketball, Swimming, Running, Travelling.