Zhenmin Cheng

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Professional field: Chemical Engineering and Technology
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Profile

Education

1990-1993: Ph.D., Chemical Engineering, East China University of Science &Technology.

1987-1990: ME, Chemical Engineering, East China University of Science &Technology.

1983-1987: BE, Chemical Engineering, East China Institute of Chemical Technology.

Academic Experience

1999-present: Professor.

1996-1999: Associate Professor.

1993-1996: Lecturer.

Research Field

Reactor simulation and internals design; multiphase Flow Theory; Interface Engineering and process enhancement; porous media simulation; Catalytic Reaction Engineering for carbon-based energy conversion。

Based on the basic theory of multiphase reactor, the research work includes the model and parameterization of fixed bed reactor, the flow field distribution, the development and simulation of trickle bed reactor, the design of hydrogenation reactor, the design of internal components and the design of fluid mechanics reactor Cold model and CFD of bubbling reactor and fluidized bed reactor; coke cleaning simulation of catalytic cracking regenerator and ethylene cracking furnace; porous Media Network Structure Simulation and particle interface Electrical Properties Research and application; Catalytic Reaction Engineering of carbon-based energy conversion represented by CO2 conversion and anhydrous ethanol synthesis.

1. chemical engineering

(1)Development, design and theoretical study of a heterogeneous catalytic reactor. This paper mainly includes the fluid mechanics of gas-solid, gas-liquid and gas-liquid-solid, and the method of reactor modeling, and the principle and application of reactor design and Development

(2)The limitations of different chemical processes in heat, mass and reaction were studied, and appropriate measures were adopted to enhance the heat transfer, mass transfer and reaction.

2. Molecular Engineering

(1) The branch of Molecular Reaction Engineering is studied, and the principles of chemical processes and catalysts characterized by Green Chemistry and zero emissions are explored At present, the development of CO electrode materials based on the reduction and conversion of CO2 and the carboxylation of misfit Louis acid-base system are the focus of the work.

(2) Molecular transfer, wettability and transition states of reaction in porous materials were studied by means of molecular simulation and quantum chemical calculation.

3. Interface engineering

(1) The methods of surface modification of catalyst material, adsorption material and ultrafine particles were studied to improve the reaction rate and selectivity at the molecular level

(2) The mass transfer between gas-solid interface and liquid-solid interface is promoted by external field, and the step interface is constructed to realize the absorption of insoluble gas and the transfer of equilibrium reaction products

Research results and selected published papers

1. Zhang XB, Cheng ZM. Performance of combined use of chlorosilanes and AlCl3 in the carboxylation of toluene with CO2. AIChE Journal. 2017;63(1):185-91.

2. Ilankoon IMSK, Neethling SJ, Huang ZB, and Cheng ZM. Improved inter-particle flow models for predicting heap leaching hydrodynamics. Minerals Engineering. 2017, 111: 108–115.

3. Wang L, Zhou ZM, Hu YW, Cheng ZM, and Fang XC. Nanosheet MgO-Based CO2 Sorbent Promoted by Mixed Alkali Metal Nitrate and Carbonate: Performance and Mechanism. Industrial & Engineering Chemistry Research. May 02, 2017. DOI: 10.1021/acs.iecr.7b00483.

4. Chen ZX, Yang J, Ling D, Liu P, Ilankoon IMSK, Huang ZB, and Cheng ZM. Packing size effect on the mean bubble diameter in a fixed bed under gas-liquid concurrent upflow. Industrial & Engineering Chemistry Research. April 20, 2017. DOI: 10.1021/acs.iecr.7b00123.

5. Wang K, Bao LY, Xing Y, Yuan PQ, Cheng ZM, and Yuan WK. Demetalization of heavy oil based on preferential self-assembly of heavy aromatics in supercritical water. Industrial & Engineering Chemistry Research. March 14, 2017. DOI: 10.1021 /acs.iecr.7b00102.

6. Wang QQ, Chen CZ, Zhong JH, Zhang B, Cheng ZM. Effect of Alkyl Chain Length of Imidazolium Cation on the Electroreduction of CO2 to CO on Ag Electrode in Acetonitrile. Australian Journal of Chemistry. 2017;70(3):293-300.

7. Liu QK, Xu Y, Tan XC, Yuan PQ, Cheng ZM, Yuan WK. Pyrolysis of Asphaltenes in Subcritical and Supercritical Water: Influence of H-Donation from Hydrocarbon Surroundings. Energy & Fuels. 2017;31(4):3620-8.

8. Ling D, Liu P, Cheng ZM. Methanol synthesis in a three-phase catalytic bed under nonwetted condition. AIChE Journal. 2017;63(1):226-37.

9. Chen XL, Yang L, Zhou ZM, Cheng ZM. Core-shell structured CaO-Ca9Al6O18@Ca5Al6O14/Ni bifunctional material for sorption-enhanced steam methane reforming. Chemical Engineering Science. 2017;163:114-22.

10. Zhao CJ, Zhou ZM, Cheng ZM, Fang XC. Sol-gel-derived, CaZrO3-stabilized Ni/CaO-CaZrO3 bifunctional catalyst for sorption-enhanced steam methane reforming. Applied Catalysis B-Environmental. 2016;196:16-26.

11. Yang L, Chen XL, Zhou ZM, Zhang R, Li L, Cheng ZM, et al. Magnetic Fe3O4@ SiO2/Pd and Fe3O4@ SiO2/Pd-M (M = Ag, Cu and Zn) Catalysts for Selective Hydrogenation of Phenylacetylene. Chemistryselect. 2016;1(18):5599-606.

12. Xu P, Zhou ZM, Zhao CJ, Cheng ZM. Catalytic performance of Ni/CaO-Ca5Al6O14 bifunctional catalyst extrudate in sorption-enhanced steam methane reforming. Catalysis Today. 2016;259:347-53.

13. Xin SM, Liu QK, Wang K, Chen Y, Yuan PQ, Cheng ZM, et al. Solvation of asphaltenes in supercritical water: A molecular dynamics study. Chemical Engineering Science. 2016;146:115-25.

14. Wang ZQ, Yang L, Zhang R, Li L, Cheng ZM, Zhou ZM. Selective hydrogenation of phenylacetylene over bimetallic Pd-Cu/Al2O3 and Pd-Zn/Al2O3 catalysts. Catalysis Today. 2016;264:37-43.

15. Wang CJ, Cheng ZM. Development of hydrocracker modeling by incorporation of vapor-liquid equilibrium. Petroleum Science and Technology. 2016;34(9):805-12.

16. Wan Y, Zhou ZM, Cheng ZM. Hydrogen production from steam reforming of methanol over CuO/ZnO/Al2O3 catalysts: Catalytic performance and kinetic modeling. Chinese Journal of Chemical Engineering. 2016;24(9):1186-94.

17. Peng C, Huang XL, Duan XZ, Cheng ZM, Zeng RH, Guo R, et al. Direct production of high octane gasoline and ULSD blend stocks by LCO hydrocracking. Catalysis Today. 2016;271:149-53.

18. Liu QK, Zhu DQ, Tan XC, Yuan PQ, Cheng ZM, Yuan WK, et al. Lumped Reaction Kinetic Models for Pyrolysis of Heavy Oil in the Presence of Supercritical Water. AIChE Journal. 2016;62 (1):207-16.

19. Gu MF, Yan XX, Cheng ZM. Hybrid catalytic effects of K2CO3 on the synthesis of salicylic acid from carboxylation of phenol with CO2. Research on Chemical Intermediates. 2016;42(2):391-406.

20. Chen Y, Wang K, Yang JY, Yuan PQ, Cheng ZM, Yuan WK. Dealkylation of Aromatics in Subcritical and Supercritical Water: Involvement of Carbonium Mechanism. Industrial & Engineering Chemistry Research. 2016;55(36):9578-85.

21. Zhu DQ, Liu QK, Tan XC, Yang JY, Yuan PQ, Cheng ZM, et al. Structural Characteristics of Asphaltenes Derived from Condensation of Maltenes in Supercritical Water. Energy & Fuels. 2015;29(12):7807-15.

22. Zhou ZM, Hu JW, Zhang R, Li L, Cheng ZM. Revisiting the reaction kinetics of selective hydrogenation of phenylacetylene over an egg-shell catalyst in excess styrene. Chemical Engineering Science. 2015;138:663-72.

23. Wu SC, Cheng ZM, Liu P, Luo W, Zhou ZM. Discrimination of methanol desorption resistance relative to the reaction steps in presence of supercritical n-hexane. Chemical Engineering and Processing. 2015;95:267-75.

24. Tan XC, Liu QK, Zhu DQ, Yuan PQ, Cheng ZM, Yuan WK. Pyrolysis of Heavy Oil in the Presence of Supercritical Water: The Reaction Kinetics in Different Phases. AIChE Journal. 2015;61 (3):857-66.

25. Qi Y, Cheng ZM, Zhou ZM. Steam reforming of methane over Ni catalysts prepared from hydrotalcite-type precursors: Catalytic activity and reaction kinetics. Chinese Journal of Chemical Engineering. 2015;23(1):76-85.

26. Peng C, Yang XJ, Fang XC, Huang XL, Cheng ZM, Zeng RH, et al. Development of Light Cycle Oil (LCO) Hydrocracking Technology over a Commercial W-Ni Based Catalyst. China Petroleum Processing & Petrochemical Technology. 2015;17(4):30-6.

27. Liu P, Wang M, Cheng ZM. Thermal Stability and Vapor-Liquid Equilibrium for Imidazolium Ionic Liquids as Alternative Reaction Media. Journal of Chemical and Engineering Data. 2015;60 (3):836-44.

28. Gao YL, Fang XC, Cheng ZM, Xu LM, Lu ZH, Wang SD. Exothermic effects and related surface properties of the ex situ presulfurized catalysts in fabrication and activation. Journal of Industrial and Engineering Chemistry. 2015;26:202-9.

29. Cheng ZM., et al. CAMURE 10 & ISMR 9, poster presentation, Qingdao, China, 2017-7-7-10.

30. Cheng ZM., et al. The 8th Asia-Pacific Chemical Reaction Engineering Symposium, Oral presentation, Shanghai, China, November 12-15, 2017.