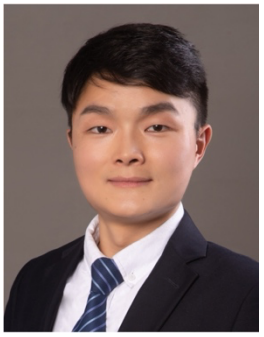
Accurate design and synthesis of high-density biofuels



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High-density jet fuels, generally with density higher than 0.8 g/mL, composed of cyclic hydrocarbons have great potential to improve the flight distance, flight speed and loading capacity of aerospace vehicles. Usually high-density fuels are produced using petroleum intermediates as raw feedstock. As response to the exhaustion of traditional fossil fuels, a new route is developed to obtain high-density fuels from biomass-derived resources, such as turpentine, cyclic ketones, furan, phenols, cyclic alcohols and so on. According to the reaction characteristics, high activity and high selectivity acidic catalysts including HPW modified MCM-41, MOF-encapsulating HPW and hydrophobic mesoporous acidic resin are prepared to catalyze dimerization, aldol condensation and alkylation reaction, respectively. By synthesizing polycycloalkanes to improve the density, adding the branched substituents to improve the low temperature properties, several biomass-derived high-density fuels with comparable performance to petroleum-based high-density fuels are obtained [1-5].

References

[1] J.-J. Zou, X. Zhang, L Pan, High-energy-density fuels for advanced propulsion: design and synthesis, John Wiley & Sons. 2020
[2] M. Xu, L. Yang, K. Tan, X. Chen, Q Lu, K. Houk, Q. Cai, *Nat Catal.* **4** 892 (2021)
[3] J. Xie, L. Pan, G. Nie, J. Xie, Y. Liu, X. Zhang, J.-J. Zou, *Green Chem*. **21** 5886 (2019)
[4] L. Pan, J. Xie, G. Nie, Z. Li, X. Zhang, J.-J. Zou, *AIChE J*. **66** e16789 (2020)
[5] J. Xie, Y. Liang, B. Yang, J. Zhang, J. Xie, J.-J. Zou, Q. Zhang, *Fuel* 340 127539 (2023)

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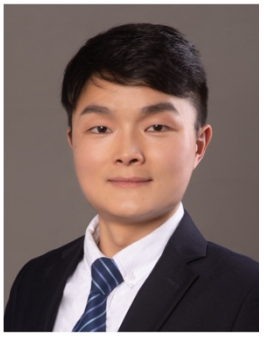

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