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Etherification of biodiesel-derived glycerol with isobutene as fuel additivesDu Zexue, Liu Xiaoxi, Zhang Wei and Chen Yanfeng Min Enze
SINOPEC, China

Glycerol is the main byproduct in biodiesel production by recycled restaurant greases that cannot be purified as medicinal glycerol, because of its some harmful impurities, but can be transformed to valuable oxygenated fuel additives by etherification with isobutene from C4 petrochemical fraction. The etherification of glycerol with isobutene has been studied over different acid catalysts under the different conditions. A multivariate analysis has been used to assess the conditions (isobutene/glycerol molar ratio, reaction time and temperature) that yielded the best catalytic results in terms of glycerol conversion and selectivity towards the di- and tri-derivates (DTBG and TTBG), while minimizing the formation of the monoderivate compound (MTBG) and the extension of the butylene di/trimerization. Results proved, formation of MTBG, DTBG and TTBG, as a result of its etherification with isobutene over acid catalysts. Glycerol fractional conversion values and di/tri-ether selectivity values approaching to 100% and 95% respectively were highly promising. Glycerol etherification results obtained by using i-butene as the reactant, proved the importance of acidic strength of the catalyst, as well as the pore diffusion resistance on the catalytic performance. A special acid catalyst, with very high dispersity of acid sites, showed excellent performance in catalyzing glycerol with i-butene, and the selectivity value of the butylene di/trimerization was reduced to less than 5%. Laboratory tests using a blend containing the glyceryl di/tri-ethers in petroleum diesel showed reduction of pour and cloud points, indicating the potential of these ethers as bioadditives to automobile fuels. Results proved that etherification of the by-product from the biodiesel of the recycled restaurant greases glycerol could be successfully achieved by using isobutene C4 petrochemical fraction, to improve the economics of biodiesel production.

Biography

Du Zexue, PhD, is a Professor, Chief Expert of SINOPEC Bio-liquid Fuel R&D Center and Vice-Director of the Foundation Research Division of SINOPEC Research Institute of Petroleum Processing. He has been engaged in bio-energy research and development since 2001. He has published more than 50 science and technical papers and holds 48 technology patents. In 2010, he took charge of finishing SINOPEC bio-liquid fuel development plan in five, fifteen and twenty-five years respectively. The SRCA biodiesel processing, finished by his research group, is successfully being applied to the set of 60 kt/a biodiesel in 2010 and 100 kt/a biodiesel in 2010.

duzexue.ripp@sinopec.com**Notes:**