

World Biodiesel Congress & Expo

December 5-7, 2016 San Antonio, Texas, USA

Controlled functionalization of amorphous carbon using multiple vapour phase sulfonation for production of biodiesel

Jidon Janaun

Universiti Malaysia Sabah, Malaysia

Sulfonated carbon-based catalysts have recently gained attention due to their high activity for esterification and transesterification reactions. Typically, sulfonated carbon-based catalysts are synthesized via heating the amorphous carbon in fuming sulfuric acid. However, this technique results in catalysts with a high total acidity, but with very low surface area. A new functionalization technique is proposed to control the total acidity and surface area of the sulfonated carbon-based catalyst through multiple vapour phase sulfonation. As opposed to the typical functionalization process, multiple vapour phase sulfonation involves repeated vapour phase sulfonation of the amorphous carbon. Multiple vapour phase sulfonation was less destructive to the pores of the char compared to liquid phase sulfonation due to a lower sulfuric acid concentration in the vapour phase. The total acidity was increased after repeated vapour phase sulfonation at the expense of the surface area and pore volume of the catalyst. The first (VPS1), second (VPS2), and third (VPS3) sulfonation steps produced carbon-based catalysts with 3.2, 3.96, 4.11 mmol g^{-1} total acidity, respectively, whereas, the specific surface area of VPS1, VPS2, and VPS3 decreased by as much as 51, 87, and 95%, respectively, yet much less than with liquid sulfonation technique. In conclusion, the multiple vapour phase sulfonation technique can be used to functionalize carbon while controlling the level of total acidity, surface area, and pore volume. Evaluation of the catalytic activities on esterification of oleic acid with methanol showed comparable reactivity to that of sugar catalyst.

Biography

Jidon Janaun has completed his PhD from the University of British Columbia, Canada in 2012. Currently, he is a Senior Lecturer at the Chemical Engineering Program, Universiti Malaysia Sabah. He has published more than 25 papers in reputed journals, has been cited 573 times with h-index of 8, based on Google Scholar. He is currently leading 2 projects with 3 PhDs and 6 Master's Students under his supervision.

jidon@ums.edu.my

Notes: