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Introduction to microwave assisted pyrolysis and its application in agricultural residue gasification

Charlie Zhang, Shudong Zhang, Liping Zhao, Yongyi Song, Jihua Liu and Xiangchen Fang
SINOPEC, China

As the population's living standard improves in rural areas of China in the last few decades, people started using more fossil fuel for their household energy consumption. However, burning of agricultural crop residue represents a major source of particulate matter, unhealthy gases emission which contributes to the worsening air quality and environmental problems in the northeastern part of China. In China, the total agriculture biomass output by 2020 could reach 800 Mt (million tons) annually. It's estimated that currently, China's biomass energy potential is as high as 460 Mt in standard coal equivalent (TCE), but only a small fracture of it has been utilized in 2016. To unlock this huge usable energy potential, DRIPP (Dalian Research Institute of Petroleum and Petrochemicals of SINOPEC) has collaborated with local municipal government and business organizations, developed a new microwave technology to turn agricultural residue and municipal waste into a convenient form of clean energy (syngas) and other value-added products (such as hydrogen and active carbon). Taking advantage of our well-established microwave facility, we have successfully demonstrated this technology both in bench-top and 10 kg/hr scale. Using Aspen Plus as a process simulation tool, a model has been established for economic analysis; and we are on our way of designing a unit in semi-commercial scale for a local community of the size of several hundred households. If the technology is proven to be robust enough for general public usage in rural areas of countryside, it will change the landscape of biomass energy development in China.

Biography

Charlie Zhang is a senior corporate fellow of SINOPEC. He received his PhD from Clark University in the United States in 1993. He is currently at Dalian Research Institute of Petroleum and Petrochemicals (DRIPP) of SINOPEC, working on several green energy and green chemical projects. His primary focus is on microwave-assisted biomass conversion and production of high value-added renewable products.

cz8729@yahoo.com

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