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Recent progress in torrefaction for upgrading solid biomass fuels

Development of renewable energy is considered as an effective countermeasure for natural resource sustainability and climate change mitigation. Currently, bioenergy accounts for the largest share in the development and utilization of renewable energy and has been extensively applied in heat and power generation as well as residential and transport sectors. Biomass can be transformed into gas or liquid fuels via a variety of methods such as gasification, pyrolysis, anaerobic digestion, fermentation and transesterification. It can also be utilized as a solid fuel and burned directly for heat and power generation. However, raw biomass possesses a number of disadvantages such as hygroscopic and biodegradable nature, high moisture content, low calorific value, large volume or low bulk density and nonhomogeneity. These characteristics result in a low conversion efficiency as well as difficulty in the collection, grinding, storage and transportation of biomass. Torrefaction is a promising technology to upgrade biomass for solid fuel production. After undergoing torrefaction, the aforementioned properties of biomass are improved to a great extent and close to those of coal. Figure-1 provides a summary to illustrate the impact of torrefaction on the properties of biomass. Consequently, torrefied biomass can be used as an alternative to coal consumed in industry. This article addresses the important issues in basic research of torrefaction, especially in the impact of torrefaction on the property variation of biomass. The potential applications of torrefied biomass in industry such as combustion, gasification, ironmaking, pyrolysis and liquefaction will also be illustrated.

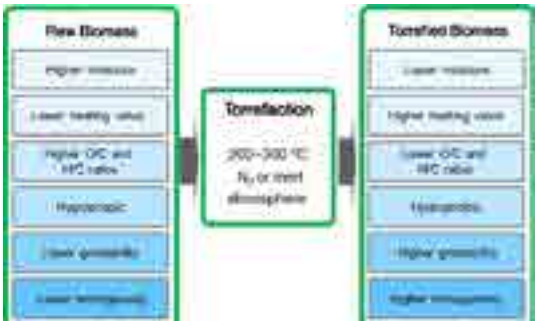

Figure-1: The impact of torrefaction on the properties of biomass.

Biography

Wei-Hsin Chen has received his PhD degree in 1993 at the Institute of Aeronautics and Astronautics, National Cheng Kung University, Taiwan and is a Distinguished Professor at the Department of Aeronautics and Astronautics, National Cheng Kung University. He has visited the Princeton University, USA, the University of New South Wales, Australia, the University of Edinburg, UK and the University of British Columbia, Canada as a Visiting Professor. His research interests include bioenergy, hydrogen energy, clean energy, carbon capture and atmospheric science. He owns a number of academic awards and has published over 160 SCI papers with an h-index of 33. He is the Editorial Board Member of international journals *Applied Energy, International Journal of Energy Research and Energie*s. He is also the author of several books concerning energy science and air pollution.

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