Keynote Speakers

Keynote Speakers 1

Hydrogen and Power Coproduction System using Integrated Exergy Recuperative Biomass Gasification and SOFC

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Abstract

A novel hydrogen and power coproduction system based on the exergy recuperative biomass gasification integrated with solid oxide fuel cell was proposed. In this system micro-tubular SOFC stacks are immersed in the internal circulating fluidized bed gasifier. The exothermic heat from SOFC is recuperated and utilized for endothermic heat of biomass steam gasification. In addition, providing the recirculation system of unreacted hydrogen separated from SOFC anode exhaust, gas turbine can be eliminated. Since the exergy loss of SOFC is much smaller than that of gas turbine, the net power generation efficiency of the combination of gasification and SOFC power generation system can be considerably improved. The internal circulating fluidized bed was composed of a moving bed high-temperature pyrolyzer with the function of tar cracking, a bubbling bed char gasifier equipped with micro-tubular SOFC stacks, and a fluidized bed combustor of remained char. A 20 kW-class pilot plant was constructed and tested. In the present study, the conceptual design of a integrated exergy recuperative biomass gasification and SOFC system for hydrogen and power coproduction and the performance of exergy recuperative biomass gasification are described.

Keywords: Bioenergy, Hydrogen Production & Storage, Fluidization

Keynote Speakers 2

If I Were a Member of SATREPS on Rhizobium Use in Agricultural Development

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Abstract

One of the roles of soil microbiologists is, in my understanding, to clarify the species of soil microorganisms and their functions and to make use of them in soil aiming at the improvement of agricultural production. Nitrogen (N) is one of the most important essential macroelements in plant nutrition. In modern agriculture, N is generally applied as chemical fertilizers such as ammonium sulfate, urea and many other compound fertilizers. However, in the developing regions where smallholder farmers are practicing rather old-fashioned agriculture, those fertilizers are not only available enough but also beyond the reach of smallholder farmers due to their high costs, and so people do not use them in general in reality. Rhizobium can fix aerial N to ammonium-N (N-fixation) in symbiosis with leguminous plants such as soybean and cowpeas etc. Thus, N-fixation is a biological process converting gaseous N unusable by plants to usable form of N. Rhizobium inoculation is so-called established technology in using rhizobial strains having high N-fixation ability under various soil conditions and is now rather common practice in modern agriculture.

It is surely possible to isolate Rhizobium strains from Indonesian soils, which may have higher N-fixation ability compared with the currently available inoculant strains in the pot experiment or other testing methods. However, when used as an inoculant in agriculture, soil microbiologists need to be sure that the inoculant forms root nodules, symbiotic organ in legume-Rhizobium symbiosis, and fixes gaseous N. As well known, there are a lot of indigenous strains of Rhizobium in soil and the inoculant needs to compete with them for nodulation. Thus, without confirming the behavior and performance of the inoculant in relation to nodule formation and N-fixation on the target legume roots growing in conventional agricultural soil, it may be too early to come to conclusion on the effectiveness of the inoculant. So if I were a member of SATREPS on Rhizobium use in agriculture, I would clarify the behavior of my inoculants in agricultural soil on the viewpoint of soil microbiologist before reaching any conclusions of the inoculation trials.

Keywords: SATREPS, Rhizobium, inoculation, fertilizers, soil microbiologist

Keynote Speakers 3

LCA of Biomass Pellet: a Review and Proposed Framework for Assessing its Environmental Impacts

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Abstract

The interest in utilizing biomass into useful products is increasing. Some of these are directed toward bioenergy development to reduce dependency on fossil fuel and mitigate global warming. In this regard, Indonesia targets to increase bioenergy use by 10% in 2025 and to reduce greenhouse gas emissions by 29% in 2030. However, an effort to increase bioenergy portion in the energy mix may trigger a discussion on its environmental sustainability in comparison to the existing use of fossil fuels. This presentation will review the environmental sustainability of biopellet (solid biomass fuels) based on peer-reviewed articles indexed in Scopus. The review focuses on studies using life cycle assessment (LCA), a quantitative approach in assessing the environmental performance of a product. This method has been widely used to assess bioenergy development in the last decade, driven by global trade and renewable energy regulations in Europe and North America. In Indonesia, LCA has recently been adopted as a national standard SNI-ISO 14040: 2016 and may be mainstreaming soon. This presentation will elaborate the types of biomass generally used for biopellet, biomass collection and transportation, production sites, methodological choices used in the LCA studies, the aspect of biogenic carbon, and the environmental impacts. Based on the reviewed LCA practices, a framework for assessing the environmental impacts of biopellet based on Sorghum biomass grown on marginal land in Indonesia will be discussed. This study links the potential utilization of degraded land, biopellet production, and global warming reduction in Indonesia.