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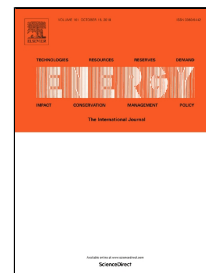
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Biocarbon, biomethane and biofertilizer from corn residue: A hybrid thermo-chemical and biochemical approach

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Abstract

In this research a hybrid thermochemical and biochemical approach is proposed to produce biocarbon, biomethane and biofertilizer from corn residue using the concept of resource recovery from biowaste. In this approach, corn residue is first pretreated in hydrothermal carbonization process to produce solid biocarbon. Hydrothermal process water, a co-product of hydrothermal carbonization process underwent fast anaerobic digestion to produce biomethane and biofertilizer. Effects of operating conditions (process temperature and residence time) on both biocarbon and hydrothermal process water contents were studied. Four selected hydrothermal temperatures of 200°C, 220°C, 240°C and 260°C and their three corresponding residence times of 10 min, 20 min and 30 min were considered. Among these hydrothermal processes, 240°C for 30 min process produced hybrid bioenergy of 14.26 MJkg⁻¹ of raw corn residue with an overall energy yield of 78.65%. Biocarbon produced at 240°C for 30 min and 260°C for 10 to 30 min were comparable to pulverised coal used in power plants, which contained high heating values of 23.01 MJkg⁻¹ to 24.70 MJkg⁻¹. All anaerobic digestion digestate are nutrient enriched and useable as liquid fertilizer.

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