Biogas Production from Energy Crops and Agriculture Residues

In this thesis, the feasibility of utilizing energy crops (willow and miscanthus) and agriculture residues (wheat straw and corn stalker) in an anaerobic digestion process for biogas production was evaluated. Potential energy crops and agriculture residues were screened according to their suitability for biogas production. Moreover, pretreatment of these biomasses by using wet explosion method was studied and the effect of the wet explosion process was evaluated based on the increase of (a) sugar release and (b) methane potential when comparing the pretreated biomass and raw biomass. Ensiling of perennial crops was tested as a storage method and pretreatment method for enhancement of the biodegradability of the crops. The efficiency of the silage process was evaluated based on (a) the amount of biomass loss during storage and (b) the effect of the silage on methane potential. Co-digestion of raw and wet explosion pretreated energy crops and agriculture residues with swine manure at various volatile solids (VS) ratio between crop and manure was carried out by batch tests and continuous experiments. The efficiency of the co-digestion experiment was evaluated based on (a) the methane potential in term of ml CH4 produced per g of VS-added and (b) the amount of methane produced per m3 of reactor volume.

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