

The Effect of Porous Alkali Activated Material Composition on Buffer Capacity in Bioreactors

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Abstract : With demand for primary energy continuously growing, search for renewable and efficient energy sources has been high on agenda of our society. One of the most promising energy sources is biogas technology. Residues coming from dairy industry and milk processing could be used in biogas production; however, low efficiency and high cost impede wide application of such technology. One of the main problems is management and conversion of organic residues through the anaerobic digestion process which is characterized by acidic environment due to the low whey pH (<6) whereas additional pH control system is required. Low buffering capacity of whey is responsible for the rapid acidification in biological treatments; therefore alkali activated material is a promising solution of this problem. Alkali activated material is formed using SiO₂ and Al₂O₃ rich materials under highly alkaline solution. After material structure forming process is completed, free alkalis remain in the structure of materials which are available for leaching and could provide buffer capacity potential. In this research porous alkali activated material was investigated. Highly porous material structure ensures gradual leaching of alkalis during time which is important in biogas digestion process. Research of mixture composition and SiO₂/Na₂O and SiO₂/Al₂O ratio was studied to test the buffer capacity potential of alkali activated material. This research has proved that by changing molar ratio of components it is possible to obtain a material with different buffer capacity, and this novel material was seen to have considerable potential for using it in processes where buffer capacity and pH control is vitally important.

Keywords : alkaline material, buffer capacity, biogas production, bioreactors

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