

Acid Hydrolysis Treatment of Nutmeg Shell Waste

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Abstract

Milled nutmeg shell waste was treated with three selected acids. These were Nitric, Sulphuric and Hydrochloric acids. The nitric acid oxidation of the shells to Oxalic acid was facilitated by the usage of a Vanadium Pentoxide catalyst. Azeotropic hydrochloric acid vapour hydrolysis was used in the HCl hydrolysis of the material to simple sugars. Varying concentrations of Sulphuric acid were used for the Sulphuric acid hydrolysis to simple sugars. These sugars can in turn be fermented to produce ethanol for fuel purposes. Lignocellulose provides a basis for the extensive development of new biotechnology for the production of chemicals and fuels. Nutmeg shell waste is one such material that is readily available in Grenada, a West Indian country.

The better yields of oxalic acid were in the region of 42%. Conditions favouring this type of yield were a reaction time of two hours and an acid to sample ratio of 8:1. Temperatures above 80°C are not recommended as the yields decrease considerably. The nitric acid recovery was 39% of initial nitric acid.

The maximum Hydrochloric acid saccharification of 24% was better than that of the Sulphuric acid saccharification process (19%). A typical packed bed biomass reactor was used in the hydrochloric acid conversions. Technologically, HCl hydrolysis is the more promising.