Sugarcane Bagasse Pretreatment Applying Microwave Atmospheric Plasma Torch

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The pretreatment processes of lignocellulosic materials are designed to remove the maximum amount of hemicellulose and lignin, in order to expose the cellulose structure. In some cases, the pretreatment may help to reduce the polymerization degree and crystalline form of the cellulose. Nowadays, the most common pretreatment routes (chemical and biological) have some complexities, such as expensive costs and unpleasant environmental impact. These drawbacks prevent the application of these conventional technologies for large scale bioethanol production with competitive prices. Because of these limitations, alternative tools are being proposed to treat biomass. One of these new techniques is associated to the so-called atmospheric pressure plasmas. Herein, a Surfatron device was coupled to a microwave source (2.45GHz) operating at 100W forward power to create a plasma torch at atmospheric pressure by using a gas mixture of argon (1.9 SLM) and molecular oxygen (0.1 SML), in order to treat about 10g of sugarcane bagasse (50% of moisture). This biomass sample was placed in a stainless steel reactor (10cm diameter). The post-discharge chemical species downstream of the plasma torch was guided into the reactor to promote the chemical degradation of the biomass. The treatment lasted 3h. The chemical composition of this post-discharge flow was measured from a Mass Spectrometer (HPR60 Hiden). After the treatment process, the bagasse was washed by 1% NaOH solution in order to remove the soluble lignin. The resulted liquor was analyzed by UV-VIS spectrophotometer. By using this technique, it was observed the lignin absorbance at 280nm which has indicated that the pretreatment process by applying the atmospheric plasma torch was able to attack the lignin of the sugarcane bagasse.