Bagasse nano-structure modifications induced by hydrothermal pretreatment revealed by CXDI

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In recent decades, the interest in the search for alternative energy sources has stimulated the use of plant bagasse generated as a product from ethanol production, such as the sugarcane waste in Brazil[1]. This material can be used as source of different sugars, for example, the cellulose, which can also be employed as a raw material in energy, paper and food industrial sectors. To extract cellulose, the bagasse must be submitted to chemical or physical processing such as the hydrothermal pretreatment[2]. The exploitation efficiency of the sugar extraction might depend on nanometric structural changes caused by the pretreatment[3]. Thus, we performed three-dimensional coherent X-ray diffractive imaging (3D CXDI) measurements of dry raw sugarcane (*in natura*) and hydrothermally pretreated bagasse samples, at ID10 beamline at ESRF (France), to verify changes in the porous network. In this presentation, we will propose a new methodology to prepare ~5 µm fragments of sugarcane bagasse and how the final ~30 nm spatial resolution three-dimensional allowed to perform accurate image analysis (segmentation). The CXDI experiments were a direct method to depict the morphological disruption of the fibrillar character from cellulose and the modifications in bagasse porosity. The understanding of porous network modifications is crucial to verify the material access to hydrolytic enzymes used in the further steps and is compulsory to determine and evaluate the pretreatment efficiency.

References

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