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APPLICATION OF INFRARED SPECTROMICROSCOPY TO CHARACTERIZE AND DETERMINE THE SPATIAL DISTRIBUTION OF LIGNOCELLULOSIC COMPONENTS IN AGRICULTURAL STRAW PELLETS

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ABSTRACT Densification of low bulk density straw to high density pellets is critical for efficient and economic, handling, storage and transportation of lignocellulosic biomass. Traditionally, various physical parameters have been established to measure the quality (e.g. density and durability) of pellets produced. However, there is no information available on chemical structure and spatial distribution of lignocellulosic components in a biomass pellet. Therefore, a comprehensive study on quantitatively characterizing the lignocellulosic composition of agricultural straw pellets and their respective spatial distribution in the matrix using infrared spectromicroscopy was conducted. Infrared spectroscopy has the potential to produce qualitative and quantitative analytical data for samples with minimum or no sample preparation, and at high speed and throughput. This will enable one to identify the specific arrangement and distribution of lignocellulosic components in a high quality pellet (according to physical parameters) and possibly make changes to manufacturing processes that could provide the desired distribution of lignocellulosic components. In this study, the application of infrared spectromicroscopy on pellets produced from non-treated and steam exploded barley, canola, oat and wheat straw will be performed.

Keywords: Lignocellulosic; Biomass; Pellets; Infrared Spectroscopy; Barley Straw; Canola Straw; Oat Straw; Wheat Straw