SCALABLE PROCESSING CONCEPTS FOR MICROWAVE PYROLYSIS

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Microwave pyrolysis of biomass has long been recognised to provide potential opportunities for producing a range of bio-based products. Unlike conventional heating, microwave heating occurs through the interaction of biomass with electromagnetic energy, with the biomass heated volumetrically by energy conversion instead of conventional heat transfer mechanisms. With microwave heating pyrolysis can be achieved within a cold surrounding environment, a feat that is not possible with conventional heating processes. This unique phenomenon presents a number of opportunities for processing of biomass feedstocks, which include enhanced product quality and a significantly simplified process flowsheet, both of which improve the economic viability of industrial biomass processing. Examples of the benefits of microwave heating include the elimination of size-reduction and particulate removal steps, and simplification of inert-gas preparation and recycling systems. These are discussed within the paper, along with the enhanced product quality that can be produced as a result.

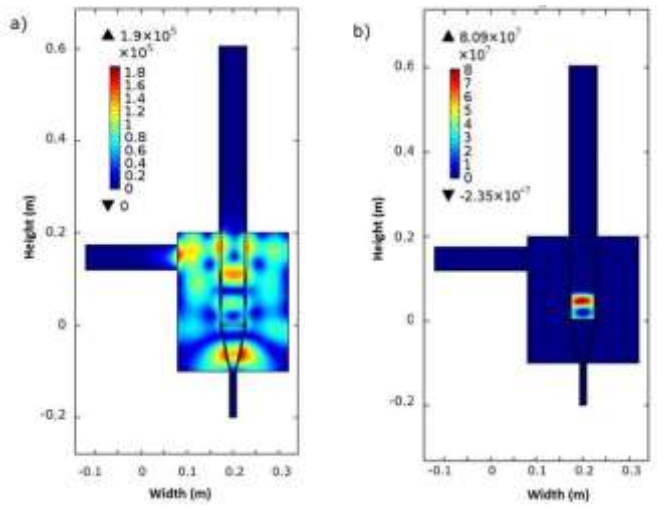

Figure 1 – Electric Field and Power Density in a microwave fluidized bed

Previous studies in this field have typically made use of fixed bed reactors, in which heating heterogeneity issues and undesired thermal runaway of the biomass are inherent. This paper presents five alternative and scalable microwave processing concepts which have already proven to successfully operate at scale, within an industrial environment. The potential application of these concepts for biomass processing, and their ability to deliver a step-change in product quality and flowsheet simplification is discussed within the paper.