

Deashing macroalgae biomass by pulsed electric field treatment

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Abstract:

Among all biomass constituents, the ashes are major hurdles for biomass processing. Ashes correspond to the inorganic fraction left after the complete combustion of the biomass and is usually made of various salt and metals. Ashes currently have low market value and can make a non-negligible fraction of the biomass dry weight significantly impacting its further processing by degrading equipment, lowering process yield, inhibiting reactions and decreasing products qualities. However, most of the current treatments for deashing biomass such as water or chemical washing are of poor efficiency or industrial relevance. We report for the first time on the use of Pulsed Electric Field (PEF) to enhance deashing of biomass from a high ash content green marine macroalga, *Ulva sp.*, using hydraulic pressing. As the high ash content of seaweed are the main drawback for its uses for bioenergy and biofuel production, the efficient removal of the inorganic fraction is crucial for macroalgae biorefinery development. By inducing cell permeabilization of the freshly harvested biomass, PEF was able to enhance the ash extraction from 18.4% (non-treated control) to 37.4% of the total ash content in average,

significantly enhancing the extraction of five of the major ash elements (K, Mg, Na, P and S) compared to pressing alone. Pulsed electric field treatment could, therefore, be used as a quick, water efficient, energy efficient, scalable, continuous or discontinuous, mild thermal and non-chemical pretreatment for deashing biomass without significantly impacting its valuable constituents and increasing its value for bioenergy production. The proposed pretreatment is particularly promising for ash removal, nutrient recovery and dewatering of biorefinery feedstock, notably of the marine source.