CHLORELLA SP MICROALGAE SUSPENSIONS RHEOLOGICAL BEHAVIOUR ANALYZES IN DIFFERENT CULTURE TIMES

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Figure 1. Bubble columns reactors (Environment Laboratory/ DEQ / EEL / USP)

Renewable fuels production got great incentive recently, with fuel prices increase and more environmental issues concerns. Among raw materials available for biofuels, microalgae emerge as a sustainable alternative due high productivity and needlessness in land and water quality. Taking into account the growing interest in microalgae use as biodiesel raw this research aims to analyze rheological behaviour of microalgae suspensions (*Chlorella sp*) in different culture times, in order to estimate the energy demands of each step, aimed optimizing the a continuous-feed tubular bioreactor construction. At the same time, *Chlorella sp* oil and biofuel physical-chemical properties and rheological behavior will be analyzed. The oil will be characterized regarding saponification, acidity and iodine contents, and fatty acids average composition. Dantas (2006) and Silva Filho (2010) methodology will be followed for biodiesel produce, which will be characterized regarding specific heat, cetane number, fatty acids average composition and triglycerides absence. Rheological analyses will be conducted with rotational concentric cylinders rheometer. To carry out this work, it will be necessary improve Environment Laboratory (Chemical Engineering Department, in Lorena Engineering School - DEQUI/EEL/USP) infrastructure through LVDV2T Brookfield rheometer and HDA620 Herz06 manual distiller acquisition. These acquisitions intended to provide rheology research consolidation, an area lacking research theme, which certainly would contribute in department potential strengthening. Besides, distiller acquisition will contribute to other biodiesel research projects in EEL because, for this fuel, cetane index is one of the most quality indicators and this property is calculated, among other parameters, from 50% of the product temperature distillation.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

In all temperature and CO_2 concentrations the cultures showed non-Newtonian behavior, for all different culture times.

	Bingham				Casson			Power Law	
	η	τ_0	X_2	K_C	K_{0C}	x^2	n	K	X^2
1	2,82 (0,13)	0 (0)	0,98	4,33 (0,19)	0,97 (0,07)	0,99	1,61 (0,01)	0,075 (0,01)	0,99
2	3,08 (0,11)	0 (0)	0,98	4,92 (0,24)	1,27 (0,12)	0,99	1,68 (0,02)	0,056 (0,01)	0,99
3	2,89 (0,19)	0 (0)	0,99	4,61 (0,25)	1,18 (0,05)	0,99	1,68 (0,03)	0,053 (0,01)	0,99
4	2,94 (0,14)	0 (0)	0,98	4,59 (0,33)	1,10 (0,18)	0,99	1,62 (0,04)	0,07 (0,01)	0,99
5	2,94 (0,12)	0 (0)	0,97	4,60 (0,25)	1,02 (0,06)	0,99	1,62 (0,03)	0,08 (0,001)	0,99
6	3,04 (0,12)	0 (0)	0,98	4,84 (0,25)	1,25 (0,14)	0,99	1,67 (0,04)	0,06 (0,01)	0,99
7	2,92 (0,10)	0 (0)	0,99	4,53 (0,21)	1,07 (0,03)	0,99	1,63 (0,03)	0,07 (0,01)	0,99
8	3,00 (0,22)	0 (0)	0,98	4,72 (0,45)	1,26 (0,21)	0,99	1,69 (0,03)	0,06 (0,01)	0,99

Table 1: Chlorella sp suspension of Rheological Parameters

Casson, Power Law and Bingham models adjusted well to the data of shear stress as a function of shear rate. It was observed no effect of culture times and little effect of temperature and CO_2 concentration on the apparent viscosity. Besides, *Chlorella sp* suspension proved a material with dilatant characteristics, such as, in all cases, the behavior index resulted values greater than one.

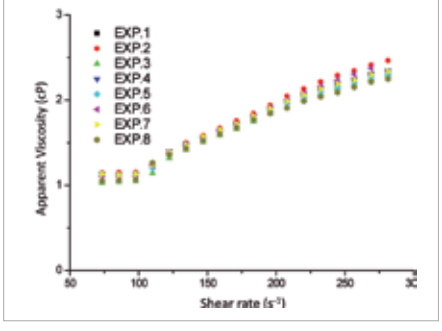

Figure 2. Apparent viscosity at different process conditions

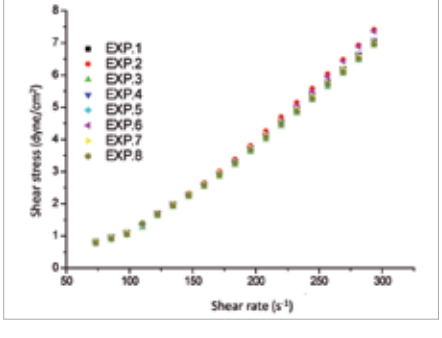

Figure 3. Rheograms in different process conditions

MAIN PUBLICATIONS

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