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ORG-04:Polyhydroxyalkanoate extraction from biomass using environmentally friend techniques.

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Currently, the typical polyhydroxyalkanoates (PHA) extraction procedure relies on the solubilization of PHA using organic solvents, particularly chloroform [1]. Researches developed extraction processes adopting more tolerable solvents like ethanol, cyclic carbonates and acetone [2]. However, the use of these solvents raises some drawbacks. In particular, their regeneration requires high amount of energy, generating costs and make the whole process less sustainable. Moreover, the use of petroleum based-solvents like the cited above is against the modern green chemistry theory, which aims to develop operations using water as solvent [3]. The object of this study is to select solvents able to reduce the energy requirements, characterized by the least toxicity and with very limited safety impacts. For this reason, we want to develop a suitable extraction method, based on the cell wall disruption using sodium chloride and the PHA extraction using sodium hydroxide. Moreover our aim is to eliminate all the steps that are critical for this separation, in particular the use of a centrifuge, because in a medium-large scale extraction, the economic impact is not sustainable, increasing the whole batch cycle time. We performed several experiments to determine the effectiveness of the proposed method. In order to study the behavior of the biomass in alkali environment we started to use different Biomass/NaOH ratio. Increasing the amount of NaOH used for the extraction, the residues reduced to reach a plateau corresponding to the PHA quantity accumulated within the. The pre-treatment in NaCl solutions was carried out before the NaOH one. The cells concentration was fixed at 10 g/L while the concentration of NaCl at 0.2 g (biomass/g NaCl) and incubated at 30°C for 3 h. We fixed the cell concentration at 10 g/L and treated with different concentrations of NaOH at 30 °C for 2 h. We also made some extraction kinetic studies at different biomass/NaOH ratios in order to investigate the time required to reach the maximum solubility value of cell residues. The analyzed biomass contained 14.6% of PHA, estimated with extraction in chloroform. Moreover, the use of ultrasound for the extraction of PHA was studied changing between pulsed or continuous wave and varying the amount of NaOH.

Keywords: *polyhydroxyalkanoates, green extraction, NaOH, ultrasounds.*
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