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DOWNSTREAM GREEN PROCESSES FOR RECOVERY OF BIOACTIVE COMPOUNDS FROM *Porphyridium cruentum*: TOWARDS A MICROALGAL BIOREFINERY

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Biorefinery can be defined as the "development of integrated processes for the conversion of biomass into energy and a variety of products, mainly biofuels and added-value coproducts, in a sustainable approach" [1]. Following this concept, algae-based biorefineries rely on the efficient fractionation of high-valuable/bioactive compounds using algae biomass.

In the present study, a downstream green process was developed for the fractionation of high-valuable bioactives from *Porphyridium cruentum* using different GRAS (Generally Recognized as Safe) solvents. These extractions were performed in sequential steps using (1) subcritical water (Subcritical Water extraction, SWE) and (2) pure ethanol (Pressurized Liquid Extraction, PLE) as solvents. The residue of each extraction step was used as raw material for the next extraction.

During the first step, different number of cycles and temperatures were evaluated in order to maximize the extraction yield of phycoerithrin, the main protein present in this microalga, and to maximize the content in sulfated polysaccharides. Furthermore, optimization of the final step (2) was performed with the objective of recovering the highest content of carotenoids. Finally, results show that the optimal temperature to maximize carotenoid content was 125 ºC. All ethanolic fractions were characterized by chromatographic techniques coupled to mass spectrometry (HPLC DAD-APCI-MS/MS). In these sense, zeaxanthin and β-carotene were the main carotenoids in ethanolic extracts.

In conclusion, a selective fractionation of high added-value compounds was achieved using the proposed green downstream platform. Potentially, these bioactives might be used in the food, pharmaceutical and cosmetic industries.

[1] F. Cherubini, *Energy Convers. Manag.* **51** (2010) 1412–1421.