ISGC 2022

N°641 / OC
TOPIC(s) : Alternative solvents / Chemical engineering

Elution of chlorophylls from a resin using aqueous solutions of ionic liquids

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PURPOSE OF THE ABSTRACT

It is urgent to develop sustainable and straightforward processes which consider biorefinery and circular economy strategies, to guarantee the planet's future. The objective is to maximize the economic value of raw materials by generating multiple products and avoiding/minimizing the production of waste streams. In this context, a simple and effective process, with industry potential, was developed to recover and fractionate both carotenoids and chlorophylls from the microalgae Isochrysis galbana. In literature, by using a solid-phase extraction technique with a strong anion exchange resin, carotenoids were easily separated from chlorophylls through chlorophylls adsorption to the resin. However, it was unknown how to recover chlorophylls as a second valuable product with high market demand due to its extensive biological activities. Thus, the focus of this work was not only to recover chlorophylls but also to reuse the resin to extend its lifetime and envision the process loop closure. After testing several solvents, aqueous solutions of tensioactive ionic liquids showed the highest elution of chlorophylls, reaching 97.0 ± 0.9 % after optimizing the operating conditions of the process by a response surface methodology. In addition, resin efficiency was tested over five cycles, where no loss of efficiency was observed. Afterward, the process was applied continuously on a small scale, showing promising results for industrial application. Finally, a chlorophyll polishing step for solvent recycling and a proposal of the final diagram of the process was also developed.

Acknowledgments: This work was developed within the scope of the project CICECO-Aveiro Institute of Materials, UIDB/50011/2020 & UIDP/50011/2020, financed by national funds through the FCT/MEC and when appropriate co-financed by FEDER under the PT2020 Partnership Agreement. Thanks are also due to the University of Aveiro and FCT/MCT for the financial support of LAQV-REQUIMTE (UIDB/50006/2020). Margarida Martins thanks FCT for her SFRH/BD/122220/2016 and Márcia C. Neves acknowledges FCT, I.P. for the research contract

CEECIND/00383/2017 under the CEEC Individual 2017.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

solid-phase extraction | carotenoids | chlorophylls | surface-active ionic liquids

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