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# Cr(III) removal from synthetic and industrial wastewaters by using co-gasification chars of rice waste streams

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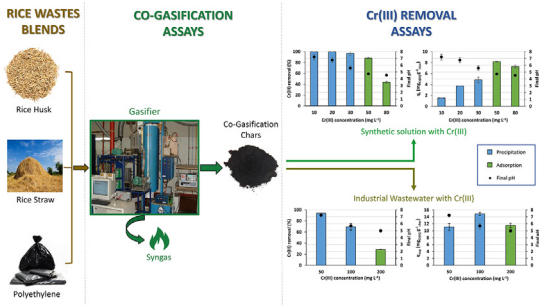
## GRAPHICAL ABSTRACT

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## ABSTRACT

Blends of rice waste streams were submitted to co-gasification assays. The resulting chars (G1C and G2C) were characterized and used in Cr(III) removal assays from a synthetic solution. A Commercial Activated Carbon (CAC) was used for comparison purposes. The chars were non-porous materials mainly composed by ashes (68.3–92.6% w/w). The influences of adsorbent loading (solid/liquid ratio – S/L) and initial pH in Cr(III) removal were tested. G2C at a S/L of 5 mg $L^{-1}$ and an initial pH of 4.50 presented an uptake capacity significantly higher than CAC (7.29 and 2.59 mg $g^{-1}$, respectively). G2C was used in Cr(III) removal assays from an industrial wastewater with Cr(III) concentrations of 50, 100 and 200 mg $L^{-1}$. Cr(III) removal by precipitation (uptake capacity ranging from 11.1 to 14.9 mg $g^{-1}$) was more effective in G2C, while adsorption (uptake capacity of 16.1 mg $g^{-1}$) was the main removal mechanism in CAC.

## 1. Introduction

Rice is the second most produced cereal in the world after maize. In 2017, 756.7 million tonnes of paddy rice were produced worldwide (FAO, 2017a). Portugal is the main rice consumer in Europe and the fifth larger producer after Italy, Russia, Spain and Greece, with an average annual production around 170,000 tonnes (FAO, 2017b).

The main wastes generated in rice production are rice husk (RH), rice straw (RS) and plastics; the latter are mainly composed by polyethylene (PE) from packaging of seeds and fertilizers. About 23% w/w of the total paddy rice is composed by RH (Prasara-A and Gheewala, 2017), and each kilogram of the harvested grain produces 1.0–1.5 kg of RS (Sangon et al., 2018). The current final destinations for these wastes are distinct: RH is used as bed material in poultry breeding, or as raw

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