

Área: ANA

Sustainability in Analytical Methods: Assessment Using AGREE Software

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Palavras Chave: Química verde, Avaliação de métodos, Sustentabilidade, Ferramentas de avaliação .

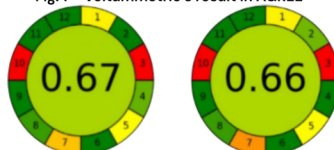
Highlights

Sustainability metrics applied to analytical chemistry; AGREE greenness to minimize environmental impacts; voltammetry highlighted as a sustainable alternative to conventional methods.

Resumo/Abstract

Green Analytical Chemistry is essential for minimizing environmental impacts in laboratory practices. This study evaluated the sustainability of two methods developed at the Laboratory of Electrospectrum Analytical (LEEA) using the AGREE software, based on the 12 principles of Green Chemistry [1]. The AGREE (Analytical GREENness) software operates by assessing the greenness of an analytical method through quantitative scoring of each of the 12 principles of Green Chemistry. The program uses a circular diagram divided into 12 sections, each corresponding to a principle, and generates an overall score ranging from 0 (less green) to 1 (more sustainable). This evaluation allows a comprehensive and accessible understanding of the sustainability level of each analytical procedure[1]. The voltammetric method from the dissertation by Caroline Athaides Miller was compared with the LC-MS/MS reference method [2]. The voltammetric method achieved a higher AGREE score (0.67) than LC-MS/MS (0.42), demonstrating lower energy consumption, safer operation, and absence of toxic or inflammable solvents, according Figure 1. Similarly, the voltammetric method from the dissertation by Juliana Rocha Guilherme was compared with the GF AAS reference method [3]. The voltammetric method scored (0.66), outperforming GF AAS (0.54) by requiring smaller sample volumes, generating less waste, and consuming less energy (Figure 1). The GF AAS method showed slightly better performance in criterion 5, by utilizing automated sample injection systems.

Fig. 1 – Voltammetric's result in AGREE



This confirms that the analysed voltammetric procedures offered a greener alternative in terms of energy efficiency, waste reduction, and safer operation, emphasizing the value of quantitative metrics to guide sustainable analytical practices.

References:

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Agradecimentos/Acknowledgments

I thank the Laboratory of Analytical Electrospectrum (LEEA) and the Federal University of Rio Grande (FURG) for support, CNPq, Professor Jean Arias for guidance on the AGREE software, my supervisor for supervision, and my coauthors for their assistance and contributions.