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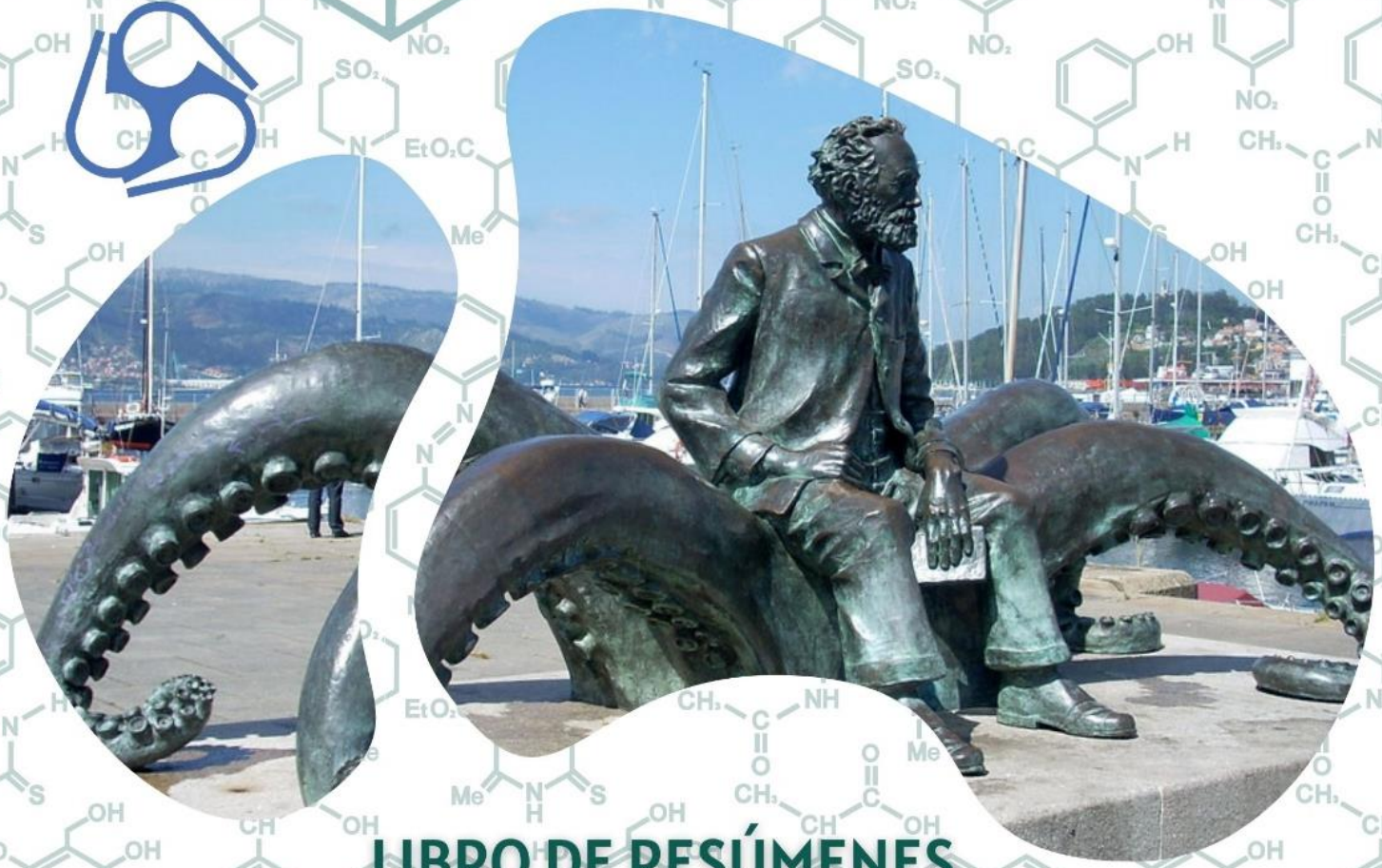

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Breakthrough Curves for the Continuous Adsorption of Micropollutants on Activated Carbon/Geopolymer Mixtures

Arthur P. Baldo[1,2], Ana Paula Ferreira[1,3], Adriano S. Silva[1], Jose L. Diaz de Tuesta[4], Pricila Marin[2], José A. Peres[3] and Helder T. Gomes[1]

[1]CIMO, LA SusTEC, Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300- 253 Bragança, Portugal;
[2]Academic Department of Chemical Engineering Sciences, Federal Technological University of Paraná—Londrina Campus, 85884-000 Paraná, Brazil;
[3]Chemistry Center of Vila Real (CQVR), University of Trás-os-Montes and Alto Douro, Quinta de Prados, 5000-801 Vila Real, Portugal;
[4]Chemical and Environmental Engineering Group, ESCET, Universidad Rey Juan Carlos, c/Tulipán s/n 28933 Móstoles, Spain;
**E-mail contact: anapaula.silva@ipb.pt*

Breakthrough curves are key for designing continuous flow adsorption systems, typically obtained experimentally or through modeling [1]. In this study, a mixture of activated carbon (AC) and geopolymers (GP) was tested in a continuous treatment system for the removal of model contaminants from waters in a single-component system composed of sulfamethoxazole (SMX), acetaminophen (ACT), or gallic acid (GA). In addition, the adsorbent materials were also tested in a multi-component water matrix to evaluate the interactions between adsorbates and adsorbents. Adsorption tests were conducted using 1g of GP and 0.5g of AC, filled with glass beads. The experiments were carried out at room temperature, considering 100 mg/L for all contaminants and natural pH of the solutions. The flow was set to 1 mL/min and controlled by a peristaltic pump. The breakthrough curves are shown in Figure 1. Based on the experimental data, the useful operating times were calculated, assuming that the effluent concentration should not exceed 5% of the initial concentration [2], yielding 228 minutes for ACT, 46 minutes for SMX, and 53 minutes for GA in the multi-component system. A reduction in time was observed when compared to the single-component system due to faster saturation caused by competition for active sites. The useful adsorption capacities were also calculated, with values of 45.7 mg/g for ACT, 9.2 mg/g for SMX, and 10.7 mg/g for GA in the multicomponent system. The overall results indicated that the column was efficient, as the contaminating compounds were removed up to the system breakthrough. In conclusion, this preliminary study suggests that these materials can be effectively combined and applied in tertiary wastewater treatments, as permeable reactive barriers.

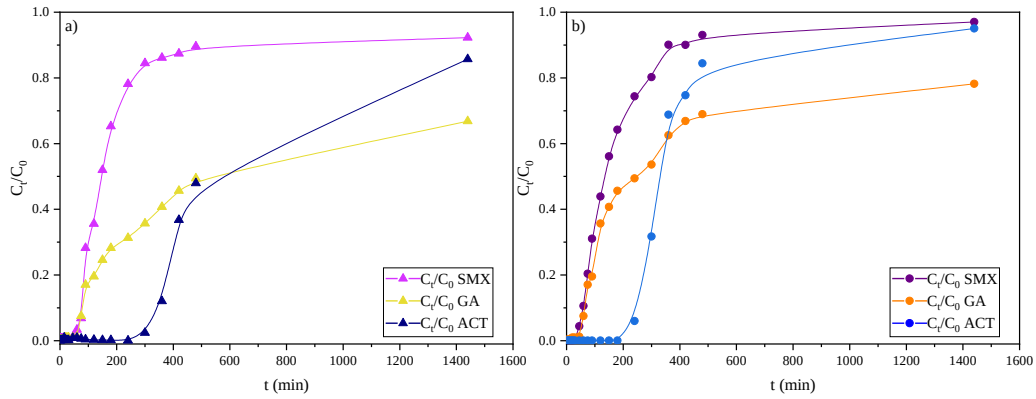

Figure 1. Breakthrough curve for a) single-component system and b) multi-component system

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References

[4] A. Abin-Bazaine, A. Olmos-Marquez, M. Campos-Trujilo, IntechOpen, 10 (2024) 1004446
[5] K. Szostak, G. Hodacka, O. Dlugosz, M. Banach, Processes, 39 (2022) 10102114