

Nº 178862

Study of the adsorption of chrome and dyes by polymeric matrixes

Nicole Aparecida Amorim de Oliveira
Fernando S. de Lima
Heber Andrada
Eduardo F. Molina

*Trabalho apresentado no CONGRESSO
BRASILEIRO DE POLÍMEROS, 17., 2023,
Joinville. 1 slides.*

A série “Comunicação Técnica” compreende trabalhos elaborados por técnicos do IPT, apresentados em eventos, publicados em revistas especializadas ou quando seu conteúdo apresentar relevância pública.

PROIBIDO REPRODUÇÃO

17th Brazilian Polymer Conference

October 29 to November 2, 2023
Expoville Convention and Exhibition Center
Joinville – SC



STUDY OF THE ADSORPTION OF CHROME AND DYES BY POLYMERIC MATRIXES

Nicole A. A. de Oliveira^{1,2*}, Fernando S. de Lima¹, Heber E. Andrada², Eduardo F. Molina²

1 – Laboratory of Chemistry and Manufactured Products, Technological Research Institute of the State of São Paulo, São Paulo, SP, Brazil nicoleao@ipt.br

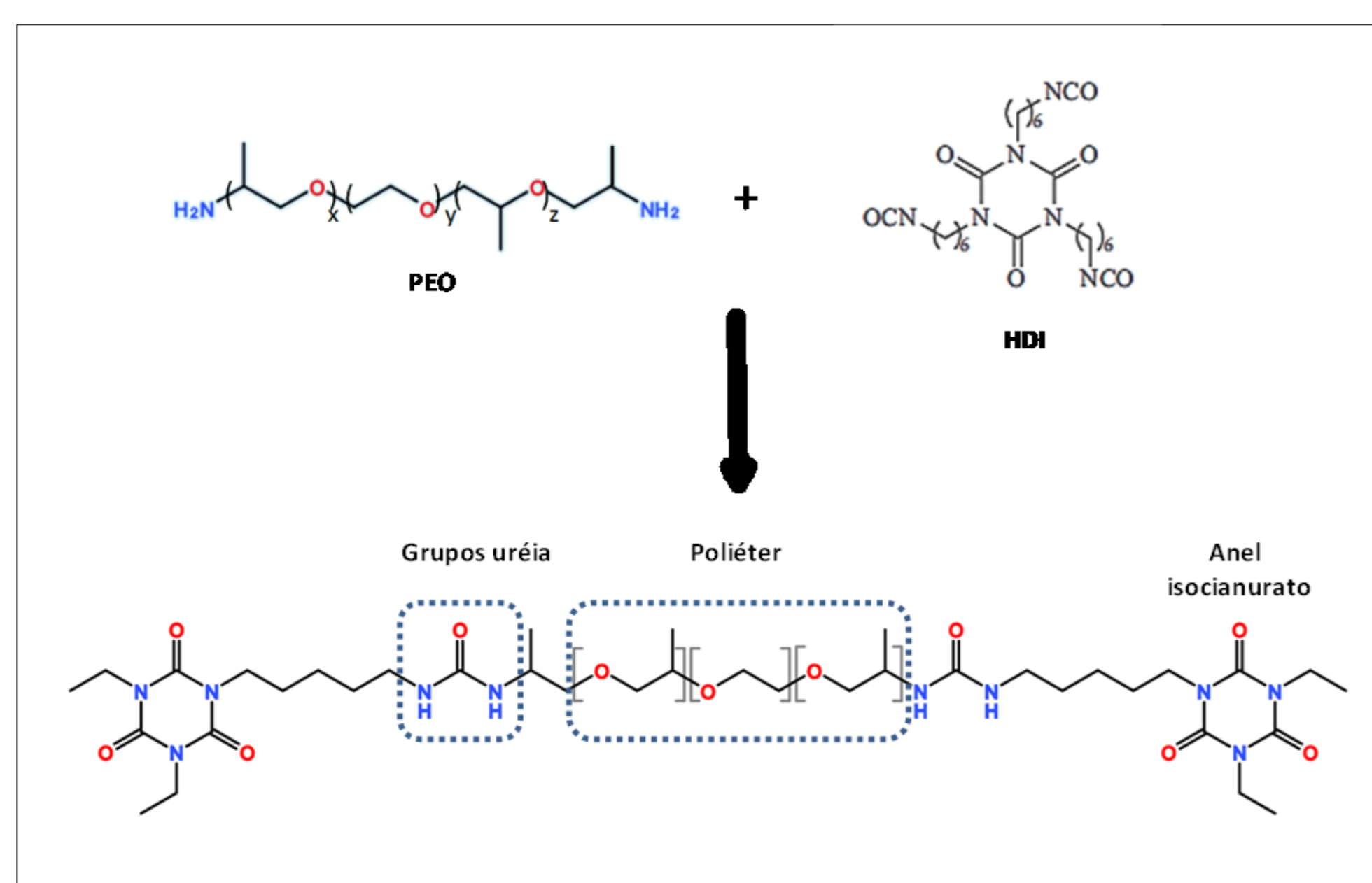
2 – Department of Chemistry, University of Franca, Franca, SP, Brazil

► Introduction

Over the years, environmental awareness has increased due to this, several technologies are being used to try to remove these pollutants from industrial and residential waste. Adsorption, oxidative processes, membrane separation, among others, are methods studied for this purpose. The adsorption process is a methodology that offers a high degree of purification and removal of contaminants for both high and low concentrations; the operational easiness and the low cost of implementation are great attractions of this technique^{1,2}. The use of polymers as adsorbents is a feasible route, however little studied with a view to film deposition or surface modification, as well as much of the literature that deals with adsorption focuses a lot on the foundation of the phenomenon^{3,4}.

► Methodology

Samples of polyurea membranes were synthesized using jeffamine[®] ED-2003 Polyetherdiamine dissolved in acetone with HDI using a molar ratio of 1:1.



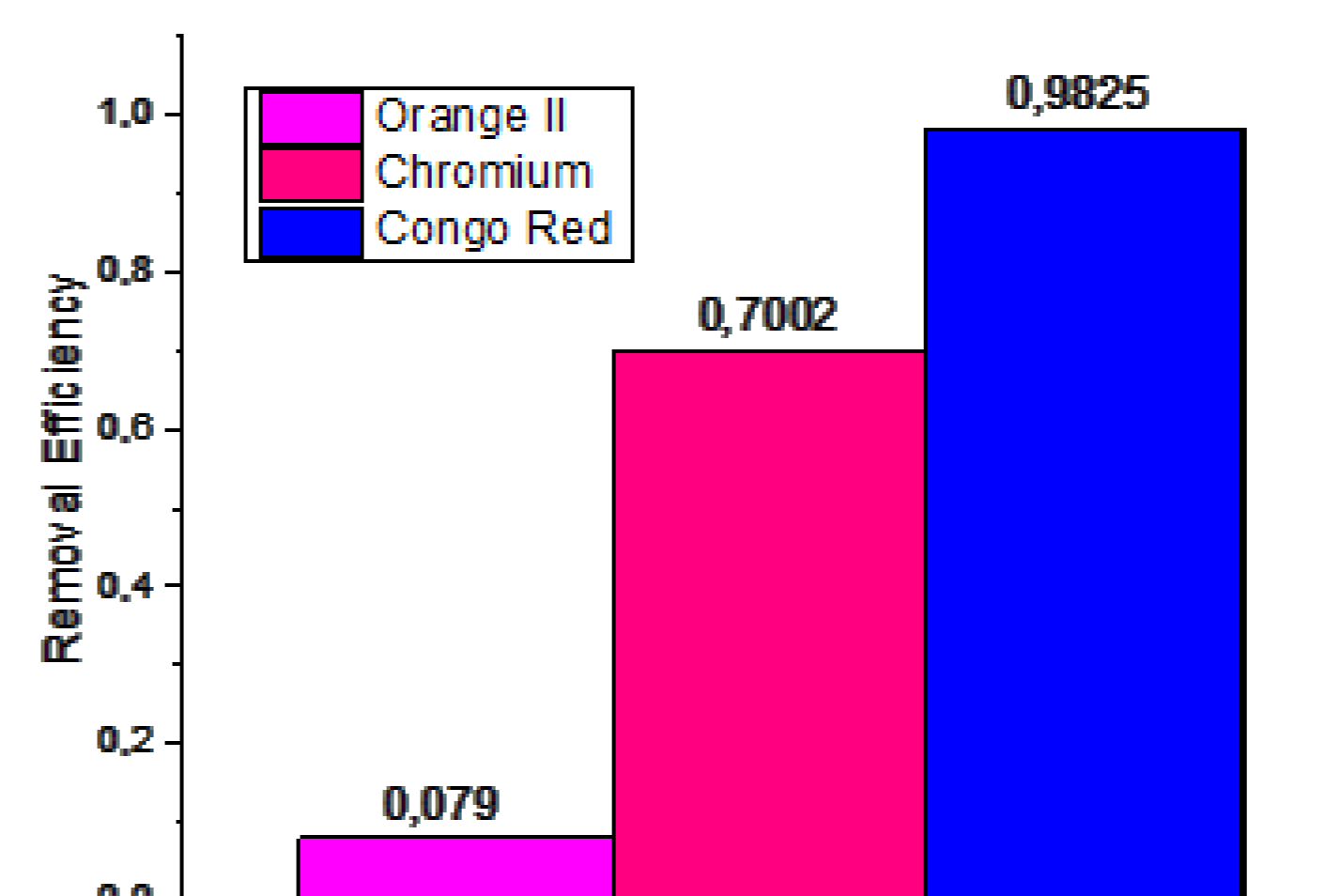
Adsorption experiment

To carry out the chromium adsorption experiments, solutions with potassium dichromate were prepared, with concentrations ranging from 4 to 10ppm. These solutions are subjected to contact with polyurea membranes with predetermined mass and surface area. The same process was realized for azo dye congo red and orange II with concentrations ranging from 10 to 100ppm.

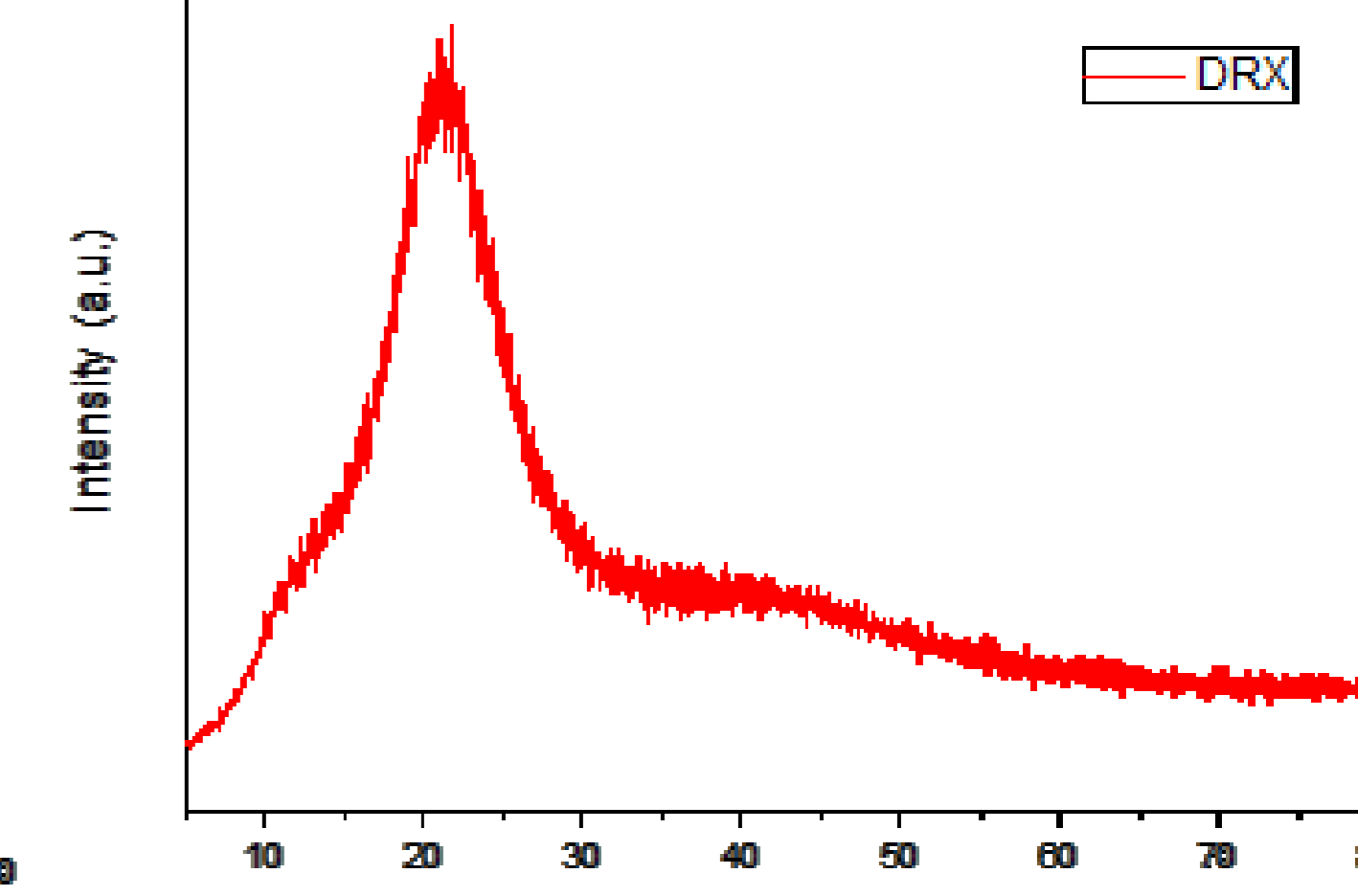
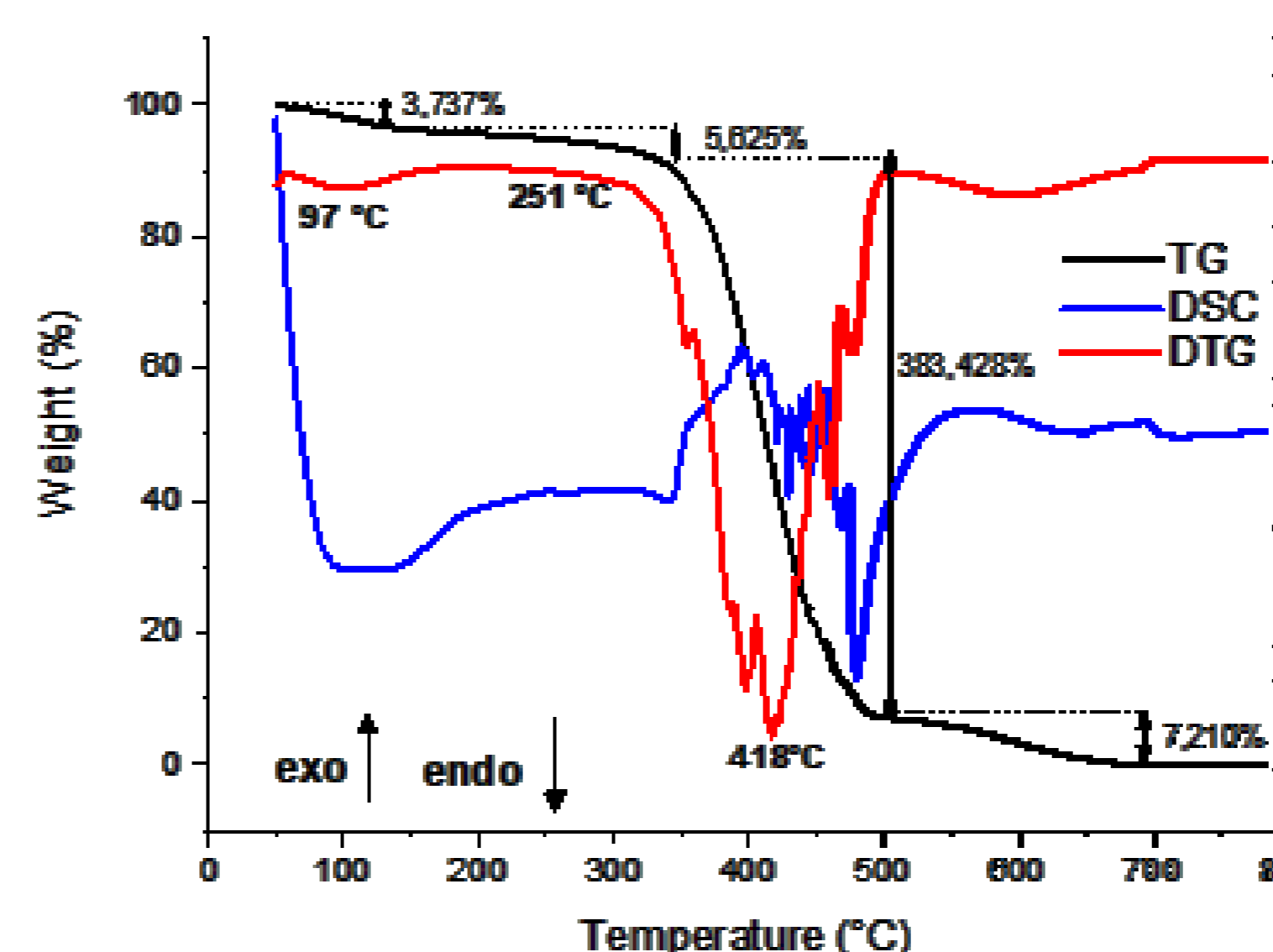
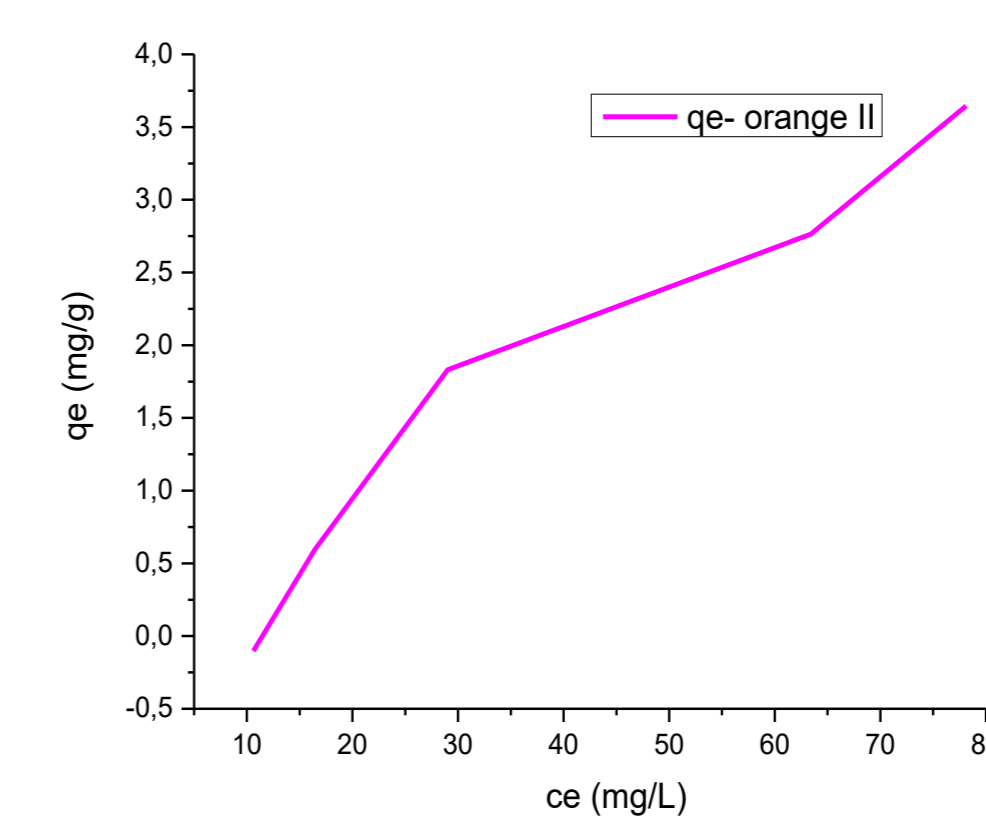
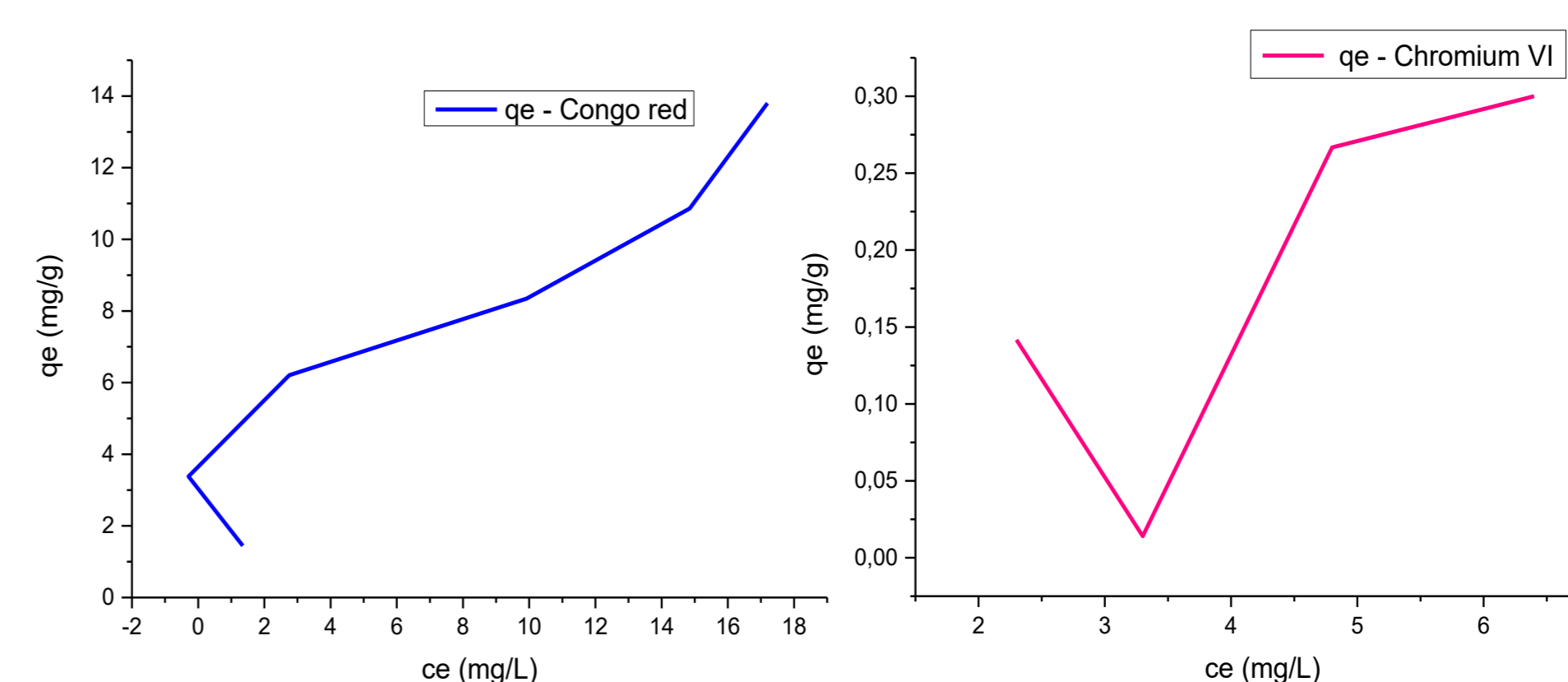
Processing of UV-VIS spectra

To process the experiments, a calibration curve was made in the region of 540nm for chromium and 499 and 487 for dyes, which is the optimal absorption region for. The solutions were periodically evaluated to evaluate the removal rate. The membranes were also periodically evaluated for their mass to measure the rate of mass gain.

► Results / Discussions



Among the adsorbates tested, it was found that Congo red had greater affinity for the membrane and its active sites, obtaining a higher removal efficiency than the others tested.



► Conclusions

The adsorption of dyes follows an L-type isotherm, while that of chromium follows an H. The adsorption of chromium VI, despite being slow, occurs in a greater proportion, possibly due to the absence of spatial limitations and competition for active sites, which tend to L-type adsorptions occur. However, the adsorbent proved to be effective in removing all tested adsorbates.

► References

- 1 TAMBOSI, J. L. Tese de Doutorado Remoção de fármacos e avaliação de seus produtos de degradação através de tecnologias avançadas de tratamento. Universidade Federal de Santa Catarina. Florianópolis, 2008.
- 2 DEL VECCHIO, P. Remoção de ácido acetilsalicílico por adsorção. Trabalho de conclusão de curso em Engenharia Química. Universidade Federal do Rio Grande do Sul. Porto Alegre
- 3 Y. Fujii, Z. Yang, J. Leach, H. Atarashi, K. Tanaka, O.K.C. Tsui, Affinity of Polystyrene Films to Hydrogen-Passivated Silicon and Its Relevance to the Tg of the Films, Macromolecules 42 (19) (2009) 7418–7422.
- 4 P. Gin, N. Jiang, C. Liang, T. Taniguchi, B. Akgun, S.K. Satija, M.K. Endoh, T. Koga, Revealed architectures of adsorbed polymer chains at solid-polymer melt interfaces, Phys. Rev. Lett. 109 (26) (2012) 265501.

► Acknowledgements

This work was carried out with the support of the Improvement Coordination of Superior Level Personnel-Brazil (CAPES)-Financing Code 001, in which I thank you for the granting of the scholarship and the support of the Institute of Technological Research of São Paulo.

