Catalytic oxidation of cyclohexanol with supports from biosorption of hexavalent chromium

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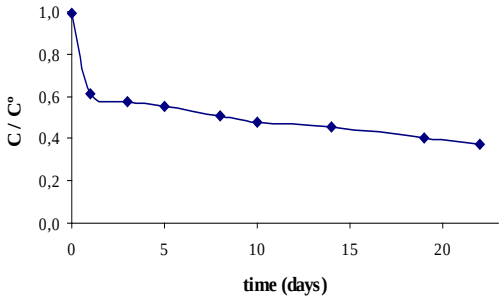
Oral presentation

Current research in the pollution control field has led to the development of several technologies for prevention and remediation. However, due to several constraints as cost, efficiency and availability of mineral resources, recovery-reuse processes are commonly suggested as the most appropriate practices [1]. Metal contamination of aqueous streams or sources is a known environmental concern, which originates mainly from the discharge of contaminated industrial effluents into the environment. Chromium is a heavy metal commonly found in effluents from tanneries, electroplating facilities and textile finishing. Unlike most heavy metals found in waste streams, Cr is commonly found in anionic form, as chromate or dichromate ions. This fact renders the treatment of Cr contaminated effluents difficult, and chemical precipitation is the most widely used process [1]. A system combining a biosorbent and an inorganic matrix, zeolite, has been proposed as a recovery-reuse process for the treatment and reutilization of chromium [2]. The biotreatment of Cr^{VI} is performed by the *Arthrobacter viscosus* bacterium, which reduces this ion to the lower Cr^{III} oxidation state. The latest exists as a cationic species that can be ion-exchanged by the zeolitic support, which is only able to exchange cations. The reutilization of the Cr containing zeolite (the exhausted supports from biosorption process) is performed in catalytic processes.

This work reports the usage of a NaY zeolite as support for the *A. viscosus* bacterium for the treatment of a Cr^{VI} solution (100 mg_{Cr}/L) and the recovery and reuse of the Cr loaded NaY as catalyst for the oxidation of cyclohexanol into cyclohexanone. The concentration of biomass has a role in the performance of the system. The higher biomass concentration (4 g/L) favoured the reduction of Cr^{VI} into Cr^{III}. The figure to the right presents the Cr^{VI} concentration over initial concentration during experimental time. After 24 hrs the initial concentration decreased 40%, with a slower decrease afterwards.



Cr loaded NaY (CrNaY) was able to improve oxidation of cyclohexanol into cyclohexanone using *tert*-butyl-hydroperoxide as oxidant. The parent NaY zeolite shows no catalytic activity for the reaction (4.5 % conversion compared to 4.0 % for the blank reaction). However, after loading with the biotreated Cr, CrNaY catalyst increased conversion to 38 %.

[1] Agrawal, A. *et al.*, Mineral Processing & Extractive Metall. Rev., 27 (2006), 99-130.

[2] H. Figueiredo *et al.*, Applied Catalysis B: Environmental, 66 (2006), 273-279.