EVALUATION OF THE ABILITY OF A BACTERIAL COMMUNITY IMMOBILIZED IN VOLCANIC ROCK TO REMOVE PRODUCTS GENERATED BY AUTO-OXIDATION OF A MIXTURE OF SULFONATED AROMATIC AMINES

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Introduction. Aromatic amines are used as precursors for the synthesis of dyes, adhesives, pesticides, rubber, fertilizers, surfactants; but certainly the major source of environmental pollution by these compounds is the synthesis and biodegradation of azo dyes (2,3). Hydroxylated amines present not only high toxicity and difficulties in degradation but also problems with auto-oxidation (1), producing dark red compounds very difficult to remove; the aim of this study was to evaluate the ability of a bacterial community to remove compounds generated by auto-oxidation of the 4-amino-3-hydroxynaphthalenesulfonic acid (4A-3OH-NS) alone and mixed with the 4-amino benzenensulfonic acid (4ABS).

Methods. The evaluation of the removal products generated by auto-oxidation of the 4A-3OH-NS, alone and mixed with the 4ABS by the bacterial community, was done in batch culture and continuous culture with the community immobilized in volcanic rock. In the continuous culture was used a packed bed column varying the amines loading rates. For both systems the amines were quantified spectrophotometrically and by HPLC, in addition, the determination of COD was a complementary technique to evaluate the degradation.

Results. The previously isolated bacterial community is composed by six bacteria of different colonial morphology; two of them have been present in all conditions tested**.** The Table 1 shows the results obtained in batch culture where the efficiencies and the volumetric loading rates of amines were quantified spectrophotometrically, obtaining better results in the degradation of 4ABS.

Table 1. Efficiencies and volumetric loading rates of amines in batch culture by the community

η (%)		B_v ($mgL^{-1}h^{-1}$)	
4ABS	4A-3OH-NS	4ABS	4AN-3OH-NS
99.6	58.6	0.564	0.02

Experimentally the formation of dark red color (with a maximum absorbance at 485 nm), by auto-oxidation of the 4A-3OH-NS was more evident in the mixture with the 4ABS, but in both systems, batch and continuous fermentation, the microbial community was able to remove completely the color, indicating a partial degradation of the formed polymers. As shown in Figure 1, the color is completely eliminated, but partially the degradation intermediates.

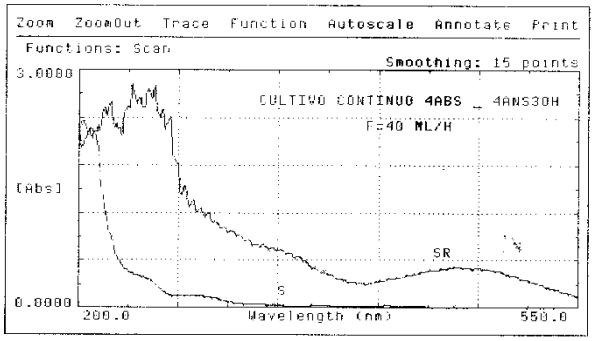

Figure 1. UV/visible spectrum to the influent (Sr) and the effluent (s) of the reactor.

Due to the polymerization of amines was not possible to assess their concentration by HPLC; an alternative way to evaluate the degradation was the determination by COD. Figure 2 shows a decrease on the volumetric removal rate when increase the volumetric load by COD, obtaining the average removal efficiency by COD of 67%.

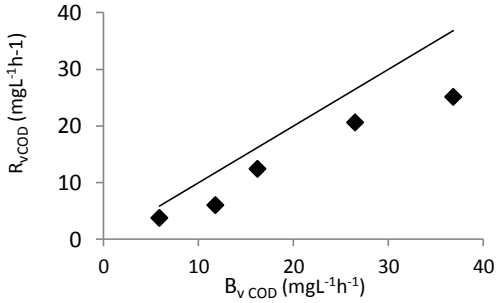

Figure 2. Removal volumetric rates operating at different loading volumetric rates by COD. Solid line represents a COD removal efficiency of 100%.

Conclusion. The bacterial community was able to eliminate completely the color formed by the auto-oxidation of amines, achieving removal efficiencies by COD near to 70%.

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