A New Method to Study Interactions between Biomass and Packing Material in Anaerobic Filters

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In anaerobic filters the biomass immobilization is achieved by entrapment in the void space and by adhesion to the surface of the packing material**.** In the upflow mode, the adhered biomass is usually considered to play a minor role due to its low proportion as compared with the total accumulated biomass[1]. However, depending on support properties such as bed and carrier porosity, surface area, and type of material, a thick biofilm can be formed increasing its importance on the overall performance[2]. If hydraulic or toxic shocks are applied the adhesion of biomass provides a more stable immobilization than the entrapment. On the other hand, the study of anaerobic filters is limited by the difficulty of determining biomass quantity and quality as well as its evolution with time and operating conditions. It is believed that a general behaviour can not be predicted and it is proposed that biomass-support interactions should be characterized for each particular application. In the present work a methodology based on the placement of several parallel mini-bioreactors in the same bioreactor was tested with two different applications: (I) Comparison of three materials (glass, Plexiglas and polyvinyl chloride (PVC)) and three carrier sizes in terms of biomass distribution between the adhered and entrapped fractions. (II) Evolution of biomass characteristics (distribution in the support and specific methanogenic activity) by regular withdrawal of some accumulated biomass. Figure 1 represents the layout of the support section for both applications. Entrapped biomass was more concentrated for the smaller pore sizes of support material and the glass, the most smoth and hydrophilic surface accumulated a thinner biofilm essencially composed of *Methanospirillum*-like bacteria. In the experiment II, a continous growth of the adhered biomass was observed, achieving a maximum of 40% of the total biomass (Figure 2). The evolution in biomass quality was assessed by measuring the potential specific methanogenic activity against direct (acetate, H_2/CO_2) and indirect (propionate, butyrate and ethanol) substrates. The acetoclastic activity achieved a maximum of 621.4 ml CH_4@STP/gVS.day on the 162nd day whereas the other measured specific activities remained stable after the start-up with the exception of propionate activity, which increased continuously during all the trial period.

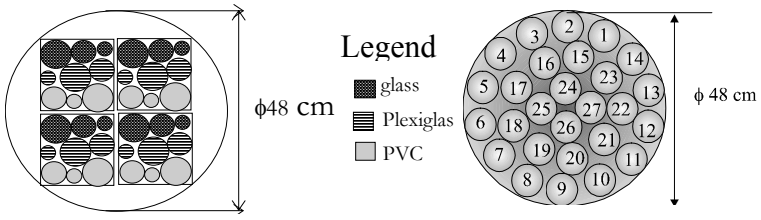

Figure 1 Layout of the support section in the experiment I (a) and II (b)

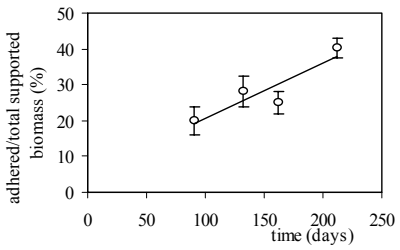

Figure 2. Time course of the ratio adhered/total supported biomass

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