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Influence of Cell Surface Characteristics on the Adhesion of Alcaligenes Denitrificans to Polymeric Supports

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One way to avoid the wash-out limitation in continuous biological systems and to increase productivity, is to retain the cells inside the reactor via immobilisation onto a support material. From a physical-chemical point of view, adhesion of cells to surfaces is determined by the interplay of electrostatic and hydrophobic interactions. Thus, the nature of the surface of the microorganisms and supports are determining factors. The two characteristics of relevance are electrokinetic potential and hydrophobicity. The adhesion of *Alcaligenes denitrificans* to several polymeric materials is being studied. The supports are: high density polystyrene (HDPS), high density polyethylene (HDPE), polypropylene (PP), Polyvinylchloride (PVC) and polymethyl-methacrylate (PMMA). The electrokinetic potential of the cells and the supports was determined by measurements of electrophoretic mobility. Cell hydrophobicity was assessed by measuring adhesion to hexadecane and the hydrophobicity of supports was determined by water contact angle measurements. Under physiological conditions, the bacterial cells and most solid surfaces are negatively charged causing a potential energy barrier which difficults the adhesion process. Nevertheless, *Alcaligenes denitrificans* for pH values above 5.0 is positively charged. Under these conditions, all the above mentioned materials to be used as carriers were found to be negatively charged. In this way, adhesion seems to be favourable and as cells and supports are hydrophobic, it might be dominated by hydrophobic interactions. So, it is necessary to determine if in the adhesion process prevails the electrostatic interaction or hydrophobicity. Studies are being performed to determine which type of material promotes a stronger adhesion and the development of the most stable biofilm, to be used as biomass carrier in denitrifying inverse fluidised bed reactors.