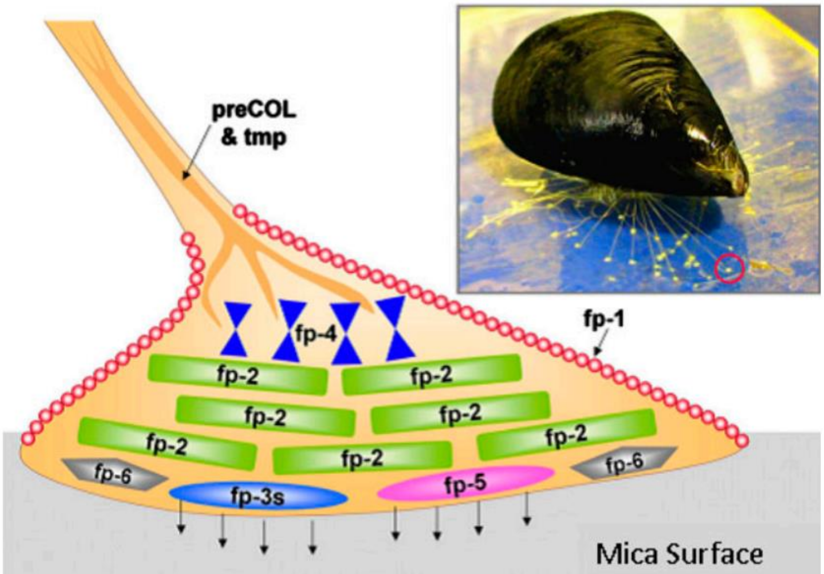
Annexe 2

3) Mussel adhesive protein

Our enzymes linked to functionalized silk must be able to attach to a wide range of surfaces. Mussels are very interesting living organisms because they are able to attach to many different surfaces. So, we chose to produce a protein present in mussel feet, the protein Mfp-5. The Mfp-5 protein has a particular amino acid derived from L-Tyrosine, L-DOPA. L-Dopa has a catechol group that interacts strongly with many surfaces such as Mica, Polystyrene and Rock. L-DOPA is not one of the 20 natural amino acids encoded by DNA, to obtain the synthetic version of this protein, we will have to transform the molecules of L-Tyrosine in L-DOPA, through a chemical reaction.



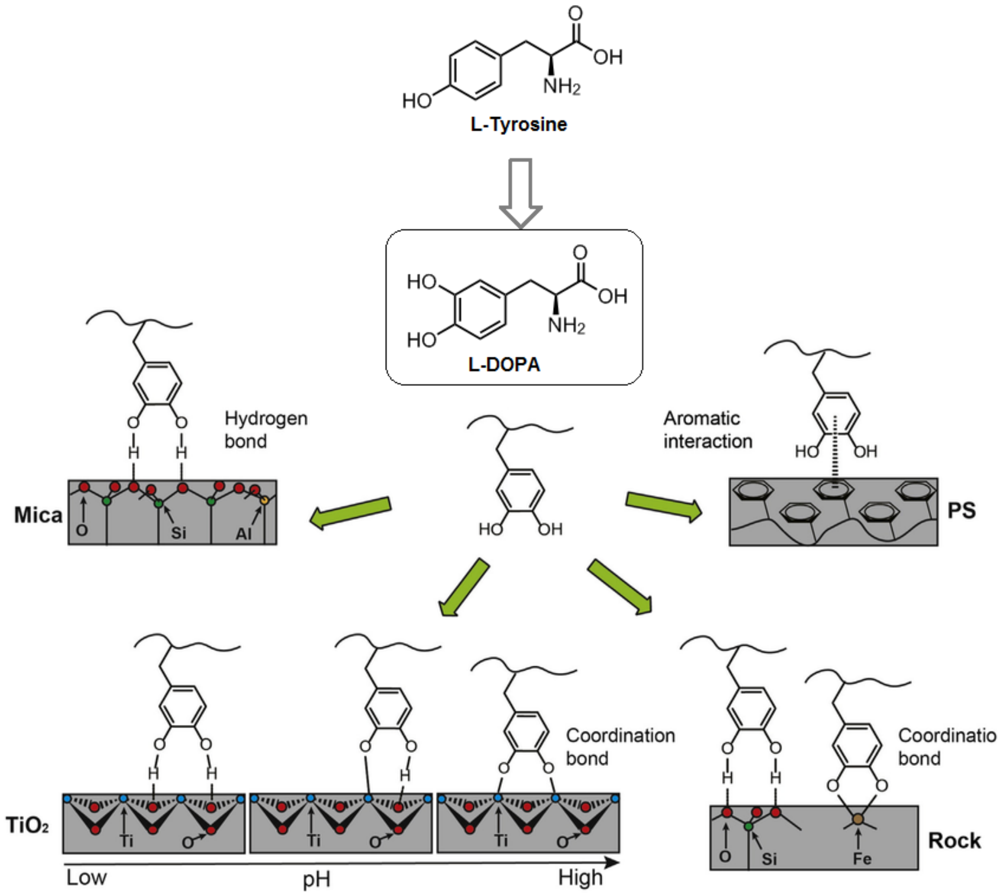


Figure 5: Mussel adhesion

Li, Lin & Zeng, Hongbo. ; Marine Mussel Adhesion and Bio-inspired Wet Adhesives. Biotribolog ; 2015

Enzymes can be linked to spider silk via another protein, streptavidin. Streptavidin is a biotin binding protein (vitamin B8). We want to produce a fusion protein composed of silk and streptavidin. The biotin molecule will be linked to the end of the enzyme chemically. Biotin will bind to the streptavidin attached to the spider silk to form our final genetic construct.

We therefore chose the use of spider fibers functionalized by enzymes for the degradation of air pollutants. Spider silk is interesting for its resistance, its elastic and hydrophobic properties. In fact, water-soluble pollutants could be "captured" by condensed water at the level of spider fiber and insoluble organic pollutants could be degraded by enzymes then solubilized in their turn to be valorized. The goal would be to produce a material that can attach to many surfaces with proteins produced by molds with high adhesion. We want to make a bio-inspired and original product.