Study of Extracellular Polymeric Substances (EPS) during biological treatment of molasses wastewater and co-treatment with activated carbon and visible light.

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1. Introduction - In this project, the activated sludge process is examined for diluted molasses wastewater (10% v/v) in three bench scale systems and it is compared with the addition of Powdered Activated Carbon (PAC) and the artificial visible light irradiation. Molasses wastewater is examined because of its problematic treatment in food industry. Biological treatment and carbon adsorption have been combined into a synergistic treatment step in order to remove soluble organics, whereas the visible light irradiation aims to wastewater bioaugmentation. EPS are studied as they constitute the main substance of activated sludge matrix. EPS determine the physicochemical and biological properties of biofilms and they are mainly composed of proteins and carbohydrates [1-3].

2. Experimental – The molasses wastewater are diluted in urban wastewater with 10% v/v ratio. The biological process is carried out in three bench scale Sequencing Batch Reactors (SBR), implementing a 12hr cycle treatment (feed, anoxic phase, aeration, sedimentation, flow). The reactors operated for 2.5 months until today and they are still in progress. The samples are collected from mixed liquor during aeration phase. Thereafter, EPS are extracted with a three stages thermal treatment method. Proteins are analysed with modified Lowry method and polysaccharides with Dubois method.

3. Results and Discussion - The results concluding from EPS study are the following. First of all, proteins dominate in comparison with polysaccharides with a percentage of 80-100%. Indicatively, protein values in soluble EPS fluctuate from 90 to 200 mg/gVSS while polysaccharide values fluctuate from 1.5 to 8 mg/gVSS. Regarding the PAC addition, the only remarkable change occurs in proteins of soluble EPS, which decrease on average from 145 mg/gVSS (biological process) to 95 mg/gVSS (PAC addition). This reduction has, obviously, been caused by the adsorptive activity of PAC. Regarding the visible light irradiation, likewise the previous case, the only noteworthy change occurs in proteins of soluble EPS, which increase on average from 145 mg/gVSS (biological process) to 200 mg/gVSS (visible light irradiation). This increase has, probably, taken place because of microorganisms bioaugmentation due to the irradiation.

4. Conclusions - The main conclusions are that proteins dominate in EPS of molasses wastewater (10%v/v). Furthermore, it is noticed that PAC addition contributed in sEPS reduction. So this method deserves to be studied further (e.g. analysis of system's efficiency-cost). The visible light irradiation increased sEPS. Therefore, it deserves further research with regard to the other characteristics of wastewater's polluting load (e.g. BOD values).

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5. References

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