P36-7

Degradation of bisphenols using immobilized laccase supported onto biopolymer marine sponge scaffolds: Effect of operational parameters on removal efficiencyK. Antecka^{1,*}, J. Zdarta¹, A. Zgola-Grzeskowiak², H. Ehrlich³, T. Jesionowski¹¹ Institute of Chemical Technology and Engineering, Faculty of Chemical Technology, Poznan University of Technology, Poznan, Poland² Institute of Chemistry and Electrochemistry, Faculty of Chemical Technology, Poznan University of Technology, Poznan, Poland³ Institute of Experimental Physics, TU Bergakademie Freiberg, Freiberg, Germany

Laccases (EC 1.10.3.2) are oxygen oxidoreductases, which catalyse widespread range of chemical reactions, mainly one-electron oxidation of mono-, di- and polyphenols. These enzymes found widespread application in textile, food and medical industry. Besides using of this enzyme in the broadly defined industry, laccase can be use in environmental protection, degrading industrial pollution. Due to its low stability and poor reusability, in recent years, there has been an increasing interest in laccase immobilization, which facilitates possibility to use of laccase at various conditions. A wide range of materials of different origin might be use as supports for enzyme immobilization. Biopolymers are interesting and noteworthy materials, which found application in environmental protection thanks to biocompatibility and biodegradability.

In presented work, spongin-based skeletons of *Hippospongia communis*, were used as a carrier for laccase immobilization. Obtained systems were used for degradation of bisphenol A, bisphenol F and bisphenol S in model solutions. Effective enzyme immobilization and degradation of those hazardous compounds were confirmed by using various methods. Moreover, effects of various initial process parameters, such as temperature, pH and concentration on the removal efficiency of bisphenols were evaluated in this study. In addition, obtained results show that reusability of the laccase was significantly improved after its immobilization.

Acknowledgment: This work was supported by the Poznan University Technology Research grant no. 03/32/DSPB/0806/2018.

<https://doi.org/10.1016/j.nbt.2018.05.1180>

P36-8

Use of magnetic halloysite nanotubes-alginate hybrid spheres in the treatment of dyes

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In this study, alginate (ALG) hybrid spheres supported with magnetic halloysite nanotubes (MHNTs) were synthesized. While “co-precipitation” method was used to gain magnetic property to halloysite nanotubes, the synthesis of halloysite-alginate hybrid spheres was done by “dripping” method. In order to determine surface characteristics of these synthesized particles, FT-IR, TGA, SEM, TEM, BET, VSM, particle size and zeta potential measurement analysis were performed. The removal of direct blue 71 (DB71), an anionic dye, by MHNT-ALG hybrid spheres was investigated in batch stirred reactors. The adsorption capacity of DB71 by MHNT-ALG hybrid spheres was compared with that of methylene blue (MB), a cationic dye. With respect to zeta potential measurements,

isoelectric point of MHNTs was measured as pH 2.89. At pH values higher than 2.89, MHNT-ALG hybrid spheres carry negative sign. However, a high DB71 adsorption capacity of 365.51 mg/g (5.64 mg/m²) was obtained at an initial dye concentration of 500 mg/L. This value was comparable to the high adsorption capacity of MB (659.92 mg/g, 8.12 mg/m²). The adsorption equilibria of dye-stuffs on MHNT-ALG beads were evaluated using adsorption equilibrium models, Langmuir, Freundlich, Redlich-Peterson models. Both the adsorption equilibria of DB71 and MB dyes were represented well by Langmuir type model. The adsorption saturation capacities, q_s , for DB71 and MB dyes, calculated from Langmuir model, were found to be 752.51 and 805.94 mg/g, respectively. The adsorption equilibrium constants, K_L , for DB71 and MB dyes were determined as 0.0025, 0.0316 L/mg, respectively.

<https://doi.org/10.1016/j.nbt.2018.05.1181>

P36-9

Effect of sophorolipid quaternary ammonium salts on activated sludge systemE. Liwarska-Bizukoja^{1,*}, D. Olejnik¹, E.I.P. Delbeke², K.M. Van Geem², C.V. Stevens²¹ Lodz University of Technology, Lodz, Poland² Ghent University, Gent, Belgium

Sophorolipid quaternary ammonium salts (SQAS) are a new class of biosurfactants obtained as a result of chemical modifications of sophorolipids towards quaternary ammonium salt derivatives. It occurred that some of them possessed stronger antimicrobial properties than the antibiotic gentamicin. In this work four innovative SQAS of antimicrobial properties were tested. The main aim of the work was to evaluate the influence of SQAS on the respiration activity of activated sludge microorganisms and kinetics of biomass growth.

The inhibition of the respiration activity of microorganisms was determined with the use of ToxTrakTM and oxygen uptake rate (OUR) tests. OUR tests were also applied for the determination of the kinetic parameters for the biological treatment of wastewater containing SQAS tested. These were substrate saturation constant (K_s) that regarded the affinity of the substrate to biomass and maximum specific growth rate (μ_{max}) expressing the effect of the SQAS on growth rate of activated sludge biomass.

Both ToxTrakTM and OUR tests showed that SQAS did not inhibit the respiration activity of activated sludge bacteria to the high extent, i.e. at the higher level than 50%, when SQAS concentration did not exceed 100 mg l⁻¹. The presence of the studied SQAS did not inhibit the growth of the activated sludge biomass, too. The values of μ_{max} for all SQAS tested were higher than those in the control test (without SQAS). Simultaneously, the elevated values of K_s indicated that the affinity of the substrate for the activated sludge biomass decreased when SQAS was present in the wastewater.

<https://doi.org/10.1016/j.nbt.2018.05.1182>