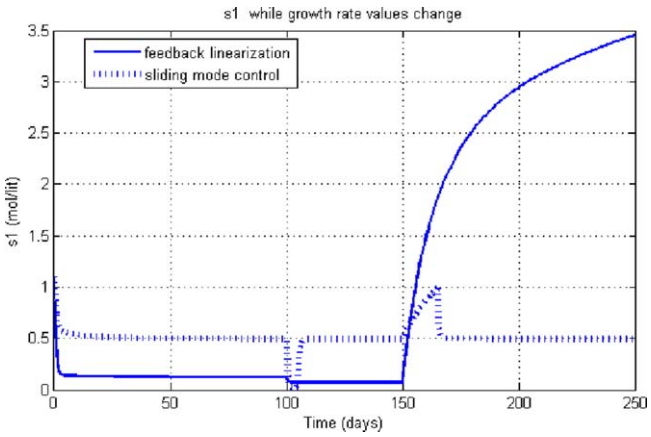


## Reference

Angulo, F., Olivar, G., Rincon, A., 2007. "Control of an Anaerobic Fixed Bed Upflow Bioreactor" IEEE. In: Mediterranean Conference on Control and Automation, July 27-29.

doi:10.1016/j.jbiotec.2010.09.065

**[P-E.44]**

### Bioreduction of Cr(VI) and chromium biosorption by acorn shell of *Quercus crassipes* humb. & bonpl

E. Aranda-García [1,*], A.R. Netzahuatl-Muñoz [1], M.d.C. Cristiani-Urbina [2], L. Morales-Barrera [1], G. Pineda-Camacho [1], E. Cristiani-Urbina [1]

[1] *Escuela Nacional de Ciencias Biológicas, IPN. Prol. de Carpio y Plan de Ayala s/n. Col. Santo Tomás. México, D.F., Mexico*
[2] *Universidad Autónoma de Chiapas. Boulevard Belisario Domínguez km. 1081s/n. Tuxtla Gutiérrez, Chiapas, Mexico*
*Keywords:* Cr(VI) Bioreduction; Chromium Biosorption; Quercus crassipes Humb. & Bonpl.; Acorn Shell

*Introduction*: Hexavalent chromium [Cr(VI)] is a toxic, mutagenic and carcinogenic heavy metal present in raw wastewaters from many industries. Biosorption has emerged as an alternative sustainable strategy for cleaning up water contaminated with toxic metals. In this sense, forest solid wastes may be good biosorbents for detoxification of Cr(VI)-polluted wastewaters.

The main aim of this work was to evaluate the effect of different environmental parameters on Cr(VI) and total chromium removal by acorn shell of *Quercus crassipes* Humb. & Bonpl. Furthermore, the kinetics and isotherm of chromium biosorption is described.

*Methods*: To assess the influence of different parameters on Cr(VI) and total chromium removal by acorn shell of *Quercus crassipes*, different conditions of particle size (0.15-1.7 mm), pH (1-4), biosorbent pretreatment (acid, alkaline, saline and organic chemical solutions), contact time (0.25-120 h), and initial Cr(VI) concentrations (10-1000 mg $l^{-1}$) were used. Cr(VI) and total chromium concentrations were determined by the 1,5-diphenylcarbohidrazide method and atomic absorption spectroscopy, respectively.

*Results*: The optimum particle size range for Cr(VI) and total chromium removal by acorn shell of *Quercus crassipes* was 0.18-0.212 mm. None of the tested pretreatments increased significantly the Cr(VI) and total chromium removal capacity of the biomaterial. The extent of sorption of total chromium by the biosorbent increased with the increase in acidity, up to a pH of 2.0. The biosorption process of total chromium followed well pseudo-second-order kinetics. Isotherm tests showed that equilibrium sorption data were better represented by the Langmuir model.

*Discussion*: Cr(VI) removal by the acorn shell of *Quercus crassipes* Humb. & Bonpl. is the result of two mechanisms: chemical reduction of Cr(VI) to Cr(III) and chromium biosorption. The high amount of total chromium uptake (250 mg $g^{-1}$) by the acorn shell places this biosorbent between the best adsorbents for the removal of total chromium from aqueous solutions.

doi:10.1016/j.jbiotec.2010.09.066

**[P-E.45]**

### Indigo removal by *Pleurotus ostreatus* under different nutritional conditions

S.E. Ruíz-Balaguera [2], L. Rincón-Chisino [1], E. Herrera-Sastoque [1], L. Castillo-Carvajal [3,*], B. Barragán-Huerta [3], A.M. Pedroza-Rodríguez [2]

[1] *JEnvironmental and Industrial Biotechnology Group. University Javeriana, Colombia*
[2] *Sabana University, Colombia*
[3] *Department of Environmental Systems Engineering, National School of Biological Sciences, National Polytechnic Institute, Mexico*
*Keywords:* Pleurotus ostreatus; Indigo dye; Decolorization

Waste water from the denim industry represents a major environmental and health problem because it contains indigo dyes whose carcirogenic effect. Decolorizaton of this dye in solid and liquid medium was tested with ligninolytic basidiomycete *Pleurotus ostreatus*. The decolorization in solid medium started in a few days and after 11 days the removal was 58 and 77% at 320 and 160 ppm at 30º C. The factors and culture conditions that affect the biological decolorization were studied by a Plackett Burman experimental desing; showing that, for the conditions evaluated the decolorization (100%) and COD removal (100%) were favored ($p < 0.049$ and $p < 0.046$) by growing *P. ostreatus* in a synthetic medium composed of: Indigo dye 320 ppm, 150 μM $CuSO_4$, 160 μM $MnSO_4$, 0.5 g/L $NH_4Cl_2$ and pH 5.0. under operating conditions of 120 rpm, 30º C, 12 h and 1% w/v as percentage of inoculum.

Finally, an investigation was made on the adsorption and kinetics of indigo in an aqueous suspension of *P. ostreatus* pellets biomass. One model was used to describe the adsorption process (Langmuir-Hinshelwood). The results of the adsorption was fitted to the model proposed showing that the viable biomass had mayor adsorption capacity (4.21 mg/g) with respect to inactive biomass (3.28 mg/g).

doi:10.1016/j.jbiotec.2010.09.067

**[P-E.46]**

### Reuse of biosolid as adsorbents by the pyrolysis process

Li-Xuan Zeng, Hung-Lung Chiang*

*China Medical University, Taiwan*
*Keywords:* biosolid; pyrolysis; adsorbent

Biosolid was taken from the petrochemical industry and it was pyrolyzed to investigate the composition and pore size distribution of pyrolytic residue. The residues component included the carbon, nitrogen, and hydrogen concentrations could be reduced after an increase in pyrolytic temperature. The pre-dried biosolid were pyrolyzed at various pyrolytic temperatures, the fraction of products in the gas phase, liquid phase, and solid residue were

20-38, 45-72, and 9-15%, respectively. In addition, $ZnCl_2$ was used as a bio-solid activation agent and the $ZnCl_2$ could enhance the pore structure development during the pyrolytic process. Results indicated the proper $ZnCl_2$ immersed concentration, pyrolytic temperature and time could produce adsorbents from the biosolid. Pore size distribution examination indicated that the mesopore was domain in the pyrolyzed residues and the specific surface area could be up to 750 $m^2$/g.

doi:10.1016/j.jbiotec.2010.09.068

**[P-E.47]**

**Isolation and characterization of new diesel-degrading yellow Gordonia sp. A-2**

P.C. Lee[1], J.H. Kim[1,*], S.H. Kim[1], J.H. Yoon[2], Y.H. Park[1], S.H. Ko[3]

[1] *Ajou University, Republic of Korea*
[2] *KRIBB, Republic of Korea*
[3] *Ecophile company, Republic of Korea*
*Keywords:* Gordonia; Diesel-degrading; Isolation

New diesel-degrading bacterium AJU A-2 was isolated from heavy oil-contaminated soil and its metabolic capability and physiological characteristics were investigated. The strain AJU A-2 was identified as a member of the genus Gordonia on the basis of chemotaxonomic characteristics and phylogenetic inference-based 16S rDNA sequence. The 16S rDNA sequence of strain AJU A-2 was most similar to that of the type strain of *Gordonia amicalis* KCTC 9940$^T$. The AJU A-2 can grow well over a broad range of pH values(5 – 9) and can grow on 5% (v/v)-diesel-containing mineral media. The yellow AJU A-2 produces structurally diverse carotenoids and their profile is influenced by culture conditions.

doi:10.1016/j.jbiotec.2010.09.069

**[P-E.48]**

**Use of a packed bed column, acting as a chemostat selector to isolate bacterial community able to aerobically degrade azo dyes**

Cleotilde Juárez Ramírez*, Eduardo Contreras Blancas, Fortunata Santoyo Tepole, Nora Ruiz Ordaz, Juvencio Galíndez Mayer, Oswaldo Ramos Monroy

*ENCB, Mexico*
*Keywords:* Azo dyes; 4-aminobenzenesulfonic acid; 4-aminonaphatalenesulfonic acid; bacterial association

The application of inexpensive biotic processes, not only for color removal but also for the complete mineralization of azo dyes present in waste waters from textile industries, has been increased in the last years. Simple decolorization of azo dyes in anaerobic conditions can produce hazardous intermediaries that usually must be aerobically degraded. For this reason, sequential anaerobic/aerobic treatment processes have been recommended; however, azo dye mineralization can be attained by a purely oxidative wastewater treatment. Because azo linkage rupture can also be achieved by microorganisms containing oxygen-insensitive azoreductases, the anaerobic stage can be obviated, obtaining a complete mineralization of azo dyes by a single aerobic treatment.

In this work, a continuously fed bubble column, packed with fragments of porous volcanic stone, was used to isolate biofilm-forming microorganisms, able to use the azo dyes Acid Orange 7; 4-[(2-hydroxy-1-naphthyl)azo] benzenesulfonic acid (AO7) and Acid Red 88; 4-(2-Hydroxy-1-naphthylazo)-1-naphthalenesulfonic acid (AR88) as carbon and nitrogen sources.

In the microbial community isolated in the packed bed reactor, five bacterial strains were identified by 16S rDNA fragment amplification procedure, they were: *Pigmentiphaga kullae, Labrys neptuniae, Kocuria* sp., *Bacillus* sp. and *Curvibacter gracilis.*

The volumetric removal rates $R_V$ and the removal efficiencies of both azo dyes and their intermediary metabolites; 4-aminobenzenesulfonic acid (4-ABS), 4-aminonaphthalene-sulfonic acid (4-ANS) and 1-amino-2-naphtol (1A2N), were evaluated in the same packed bed biofilm reactor used to select the bacterial community. The azo dyes loading rates $B_V$ varied from 3.5 to 40 mg $L^{-1}h^{-1}$. AO7 removal rates were always proportional to $B_V$, thus AO7 removal efficiency was 100%. *AR88* was 97%, except for the intermediary byproduct 4-ANS, no other metabolite was detected in the outflowing medium. Overall removal efficiency, measured through Chemical oxygen demand (COD) was 94%. The results obtained show that both azo dye were aerobically degraded by the bacterial community.

doi:10.1016/j.jbiotec.2010.09.070

**[P-E.49]**

**Feasibility of sugar cane juice as a sole carbon for polyhydroxyalkanoates (PHAs) production via batch fermentation by *Alcaligenes latus* TISTR 1043 and *Alcaligenes eutrophus* TISTR 1095**

Waranya Suwannasing*, Pakawadee Keawkannetra, Samart Mooamart

*Khon Kaen University, Thailand*
*Keywords:* sugar cane juice; polyhydroxyalkanoates (PHAs); fermentation; *Alcaligenes latus*; *Alcaligenes eutrophus*

This work aims to investigate feasibility of sugar cane juice can be used as a sole carbon for biopolymer of polyhydroxyalkanoates (PHAs) production via batch fermentation by pure bacterial strains of *Alcaligenes latus* TISTR 1043 and *Alcaligenes eutrophus* TISTR 1095. Sugar cane juice was characterized and composed of total sugar 105.5 $gL^{-1}$ (36.6 $gL^{-1}$ sucrose, 26.0 $gL^{-1}$ fructose, 21.8 $gL^{-1}$ glucose and 21.1 $gL^{-1}$ other sugars). Then, the *A. latus* and the *A. eutrophus* were separately cultivated in the medium containing 20 $gL^{-1}$ initial total sugar in 250 mL shake flasks under controlled condition of 30 °C, 200 rpm, pH 6.5-7 and with 10% inoculums size. It was found that the *A. eutrophus* grown better than the *A. latus*. Thus, the *A. eutrophus* was further cultivated in different initial total sugar concentrations (20, 30, 40 and 50 $gL^{-1}$) under controlled condition (200 rpm, 30 °C, pH 6.5-7 and 10% inoculums size). The optimal total sugar concentration of 50 $gL^{-1}$ was reached. The dry cell mass (DCM) and maximum PHAs were obtained at 6.013 $gL^{-1}$ and 1.84 $gL^{-1}$ after 60 hr fermentation converted to biomass yield ($Y_{x/s}$) and product yield ($Y_{p/s}$) of 0.163 and 0.050. While, specific product yield ($Y_{p/x}$) and productivity were 0.306 and 0.031 $gL^{-1}h^{-1}$. To increase the PHAs production, 5 L fermentor (2 L working volume) was considered using the optimal condition obtained from the flask scale under aerobic condition (30% dissolve oxygen). The DCM and the maximum PHAs were 5.881 $gL^{-1}$and 1.281 $gL^{-1}$ calculated to values of $Y_{x/s}$, $Y_{p/s}$, $Y_{p/x}$ and productivity at about 0.190, 0.041, 0.218 and 0.0213 $gL^{-1}h^{-1}$, respectively. However, potential of sugar cane juice as a sole carbon is still low. Further work will be focused on improvement of the efficiency for PHAs production. C:N ratios and percentages of dissolve oxygen will be concerned.

doi:10.1016/j.jbiotec.2010.09.071