



May 26-28, Leeuwarden

IAP
2014

**Interfaces in Water and
Environmental Science**

PROFESSOR PASCAL VAN DER WOUDE



Gemeente Leeuwarden

provinsje fryslân
provincie fryslân



wetsus

centre of excellence for
sustainable water technology



**WATER
CAMPUS**

Leeuwarden

Wetsus is co-funded by

- the Dutch Ministry of Economic Affairs (IOP-TTI Peaks in the Delta)
- the Dutch Ministry of Infrastructure and the Environment
- the European Union (European Fund for Regional Development and Seventh Framework Programme)
- Northern Netherlands Provinces (REP-SNN)
- the City of Leeuwarden, the Province of Fryslân and University Campus Fryslân



Ministry of Economic Affairs



Ministry of Infrastructure and the Environment



SNN



27	Alexandra Ribeiro	Potential of electrokinetic process for the remediation of estrogens in soil	155
28	Alexandra Ribeiro	Potential of salt marsh plants for the remediation of organic compounds	156
29	Zygmunt Sadowski	Effect of pH on adsorption of arsenic onto fly ash	157
30	Toshio Sakai	Removal of hypophosphite ions from water using ultrasound	158
31	Umarat Santisuk-kasaem	Hydrodynamic behavior of Zero-valent Iron Permeable Reactive Barriers: Effects of Permeability Loss	159
32	Wenfeng Tan	Protein complexation with Humic acids	160
33	Sagdat Tazhibayeva	Biocomposites on the base of yeast cells and diatomite such as sorbents of metal ions	161
34	Sagdat Tazhibayeva	Regulation of biodispersies stability by cationic polymers	162
35	Arnaud Villard	Decontamination of solution containing radioactive strontium by sodium nonatitante	163
36	Mingxia Wang	One-step synthesis of δ -MnO ₂ nanoparticles using ascorbic acid and their scavenging properties to Pb(II), Zn(II) and methylene blue	164
37	Kenta Yamada	Effect of Soil Colloidal Properties on Surface Runoff from Tottori Masa Soil	165
38	Gao Yingxin	The Mechanism of degradation on 4-Chlorophenol by Pulse Radiolysis	166
39	Miaoyue Zhang	Transport and retention of multi-walled carbon nanotubes in different porous media	166
40	He Zhao	Direct Electrochemistry of Horseradish Peroxidase based on Carbonized Chicken Eggshell Membranes Materials	167
41	Sangho Chung	Development of Functionalized Graphene Electrode for Water Softening	168
42	Marta Hatzell	Enhanced energy generation with capacitive electrodes driven by Exoelectrogen-generated ionic currents	169
43	Felix Hippauf	Solid-State NMR Studies on Adsorption of Electrolyte Ions in Carbon Materials with well-defined Porosity	170
44	Mathijs Janssen	Temperature and size effects on the desalination of water	171
45	Doo-Hwan Jung	Preparation of Chestnut-like Carbon Electrodes for Capacitive Deionization	172
46	Peter Kovalsky	Multidisciplinary modelling of CDI using optimisation tools: implications for agricultural applications	172
47	Dmytro Kudin	Water Denitrification using Energy-Efficient Capacitive Deionization Technology	173
48	Xia Shang	Fabrication of composite capacitive deionization electrodes using biochar materials and conductive membranes,	174
49	Nataliya Mishchuk	Electrokinetic remediation of fine clay soils contaminated by Hydrophobic organic pollutants	175

Biocomposites on the base of yeast cells and diatomite such as sorbents of metal ions

Tazhibayeva S.M., Korzhynbayeva K.B., Musabekov K.B., Zhubanova A.A., Burkitbaev M.M.

Al-Farabi Kazakh National University

Tazhibayeva_s@mail.ru and www.kaznu.kz

The problem of wastewater treatment is one of the most actual problems of modernity. Especially also extremely actual problem is cleaning wastewater of metallurgical industries from the metal ions. Natural minerals and synthetic ion-exchangers are widely used for remove the metal ions. Alternatively, they may serve as microorganism cells containing on its surface a different of functional groups like amine, carboxyl, hydroxyl, phosphate, sulfide, sulfhydryl, etc.

Were conducted experiments on the adsorption of ions Cu^{2+} and Pb^{2+} on the surface of yeast cells *Rhodotorula glutinis*. It has been shown that at the initial concentrations in the range of salts of Cu^{2+} and Pb^{2+} from 10^{-6} to 10^{-1} mol/l the removal degree of metal ions varies between (95.2 and 98.3)% to (50.1 and 59.7)% for ions Cu^{2+} and Pb^{2+} , respectively. In this case the adsorption equilibrium is reached after 30 minutes.

Method of IR spectroscopy shows that the interaction of yeast cells with ions Cu^{2+} and Pb^{2+} is realized by amino-, phosphate, carboxylic and hydroxyl groups of the surface, the ions Cu^{2+} are dominant donor-acceptor interaction with amino groups and ions Pb^{2+} - ion exchange with the phosphate and carboxyl groups. Due to the high lyophilic surface of cells their separation from solutions difficult. Therefore were carried out experiments to immobilize the cells *Rhodotorula glutinis* on the surface of natural mineral diatomite. Diatomite also has high sorption capacity with respect to the ions Cu^{2+} and Pb^{2+} , but does not provide complete water treatment. The removal degree of Cu^{2+} and Pb^{2+} ions by diatomite in the concentration range of their salts 10^{-5} - 10^{-1} mol/l is (92.1-15.6)% for Cu^{2+} ions and (95.6-20.3)% for Pb^{2+} ions.

Experiments to immobilization of *Rhodotorula glutinis* cells showed that the attachment of cells to solid surfaces most efficiently at the surface of diatomite provisional modifications of polyethylenimine solution with a concentration of 0.03 base-mol/l. Modification of mineral surface with cationic polymer creates favorable conditions for attachment thereto of negatively charged cells of microorganisms. It is shown that by using the obtained composite biosorbent to remove of Cu^{2+} and Pb^{2+} ions from solutions the treatment degree of water is reaches 97.8-99.4 %.