

SfP – ZEOLITES

SfP – 972494

Improvement of the Biological Degradability of Wastewaters Using Activated Zeolites

Project Co-Directors: Prof. Scot E. Smith, University of Florida, Gainesville, USA (NPD)
Dr. Peter Princz, Living Planet, Ltd., Budaors, Hungary (PPD)

Approval Date: 9 November 1999 Effective Starting date: 9 January 1998

Duration: 5 years; completed in 2004

NATO Budget: 194 596 EUR

Information about the SfP Project through Internet: <http://www.living-planet.hu>
<http://www.surv.ufl.edu/nato/>

Major Objectives

- Development of a novel method for zeolite modification with cation active polymers (CAP)
- Development of a wastewater treatment method and industrial technology based on the application of zeolite modified with CAP (CAPMZ)
- Increase of the decomposition rate of organic compounds at biological wastewater treatment plants (WWTP)
- Improvement of the nitrification and denitrification activity of activated sludge
- Improvement of the settling characteristics of surplus sludge
- Improvement of the quality of wastewaters biologically treated
- Decrease of the investment and operation costs of WTPs

Overview of Achievements

- Collection of available data and determination of the missing physical-chemical properties of Hungarian zeolitic rocks; mineral composition, cation exchange capacity, Si/Al ratio, zeolite content
- Based on the physical-chemical properties, selection of natural zeolites for further experiments
- Mechanical and chemical pre-treatment of the selected zeolitic rocks
- Modification of the pre-treated zeolites with CAP containing quaternary ammonium or amino groups applying different CAP/zeolite ratio, molecular weight of CAP
- Determination of the total organic carbon and the chemically bound CAP content of CAPMZ
- Characterization of the bond-strength between CAP molecules and zeolite surface
- Determination of the effect of CAPMZ on biological oxidation, reaction rate and order, as well as effluent water quality and sludge quality
- Development of a combined, one-step zeolite modification method
- Development of a semi-industrial method for zeolite modification
- Preparation of the documentation of wastewater treatment technology (WWTT) applying CAPMZ (trade name: ZeoRap[®])
- Authorization of the ZeoRap[®] WWTT in Hungary (Authorization No. F- 173, issued by National Water Authority in Hungary)
- Implementation of pilot- and industrial-scale experiments using CAPMZ at the WTPs of Dunakeszi, Dorog, Jánossomorja, Kiser, Mezőszilas, Mosonmagyaróvár, Pilisszentkereszt, Tét, Szob, Szilasnémeti and Veresegyháza in Hungary

- Evaluation of the water and sludge quality data of the pilot- and industrial-scale experiments
- Economic assessment of the ZeoRap[®] WWTT
- Development of a mathematical model forecasting the water and sludge quality, as well as economical effects of ZeoRap[®] WWTT on biological WWT
- Hungarian patent (patent No. 1788/04) and PCT patent application (file number: P0004740) for the methods of zeolite modification and WWTT using CAPMZ

Total payment through NATO funds: 188,023 EUR

Visibility of the Project

- 3 scientific papers, 3 conference proceedings
- 8 conference presentations
- 6 presentations on television, 5 presentations on radio
- 21 articles and publications in daily papers and magazines

NATO Consultant

Dr. Etienne Vansant, University of Antwerp, Wilrijk, Belgium

Collaborating Institutions

- Budapest Technical University H-1521 Budapest, Szene Gellert t. 4.
- Central Chemical Research Institute H-1025 Budapest, Pusztaszeri út 59-67.

Major end-users in Hungary:

- Danube-valley Regional Waterworks, Inc. H-2600 Vác, Hairdo u. 3.
- Water and Sewerage Works of Dombóvár and its Env. Ltd. H-7201 Dombóvár, Berzsényi u. 1.
- North-Transdanubian Waterworks, Inc. H-2800 Tatabánya, Sárberék 100.
- ZEOTRADE Mining and Processing, Inc. H-3909 Mád, Vasút u.1.
- KOMPLEX Assembly and Constructing Ltd. 2801 Tatabánya, Élmunkás sor 1.
- Unichem Chemical Manufacturer, Ltd. H-6760 Kistelek, Tanya 491.
- Chematech Trading, Ltd. H-8600 Siófok, Széchenyi u. 8-10.

Major end-users in other countries:

- Uwatech Int. Consultant Ltd., Germany, USA, Hungary uwatech@mail.inext.hu
- Boulder Innovative Technologies, Inc., USA rich@zeoponix.com
- Zeolite Australia, Ltd., Australia laldock@bigpond.net.au

Abbreviations: CAP - cation active polymer, CAPMZ - zeolite modified with CAP, WWTP - wastewater treatment plant, WWTT - wastewater treatment technology, PCT - Patent Co-operation Treaty

28 February 2005

Dr. Péter Princz
Hungarian Project Director

Dr. Scot E. Smith
American Project Director