

Phenol Biodegradation by Fungal Cells Immobilized in Sol-Gel Hybrids

Kolishka V. Tsekova^a, Georgi E. Chernev^b, Alexander E. Hristov^a,
and Lyudmila V. Kabaivanova^{a,*}

^a Institute of Microbiology, Bulgarian Academy of Science, Acad. Georgy Bonchev Str., bl. 26, 1113 Sofia, Bulgaria. Fax: +359 2 8700109. E-mail: lkabaivanova@yahoo.com

^b Department of Silicate Technology, University of Chemical Technology and Metallurgy, 8 Kl. Ohridsky Blvd., 1756 Sofia, Bulgaria

* Author for correspondence and reprint requests

Z. Naturforsch. **68c**, 53–59 (2013); received January 31, 2012/January 23, 2013

The capability of cells of the fungus *Aspergillus awamori*, either free or immobilized in hybrid sol-gel material cells, for phenol biodegradation was demonstrated. Phenol was present in the reaction mixture as the sole carbon and energy source, and its decomposition was followed in repeated batch degradation experiments. Atomic force microscopy provided information on the development of self-organizing structures in the materials synthesized by the sol-gel method. Phenol biodegradation was mediated only by the fungal cells, and no absorption by the hybrid matrix was observed. Ten cycles of phenol biodegradation using the immobilized cells system were conducted during which up to 2000 mg l⁻¹ phenol was completely decomposed. Immobilized cells degraded phenol at 8.33 mg h⁻¹, twice as fast as free cells. The good performance of the immobilized fungal cell system is promising for the development of an efficient technology for treating phenol-containing waste waters.

Key words: *Aspergillus awamori*, Phenol Biodegradation, Sol-Gel Hybrid