Potential applications of porous ceramic materials from Devonian and Quaternary clay deposits of Latvia for biotechnological purposes

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Introduction

Clay is the most common sedimentary rock, which forms the largest part of the Earth upper crust. After treatment it is widely used in industry [1]. Porous clay carriers can be used in wastewater treatment [2], in environmental bioremediation [3] and in other fields of biotechnology.

Adhesion is the most successful process of microorganism immobilization, because it naturally occurs in environment over millions of years. Usually, clay shows microorganism friendly effect, but some clays can accord bactericide effect, that also can be used in biotechnology.

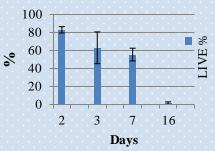
Materials & Methods

Ceramic granules were prepared at the Institute of Silicate Materials, Riga Technical University. The main raw material was clay obtained from Latvian clay deposits. Adhesion of *P. putida* MSCL 650 was carried out in the controlled batch experiments. Total number of bacteria and the number of viable bacteria (colony forming units – CFU) in the suspension recovered from surface of granules and grounded granules were monitored throughout incubation at 28 °C. The results were expressed as CFU per gram. Then granules were dehydrated at 22 °C during 16 days. Bacteria were stained and observed under a fluorescence microscope (Leica DM 2000).



Results & Discussion

Experimental data analysis showed that bacterial adhesion has taken place in all of the investigated expanded clay granules sintered at temperature of 1100-1200 °C. The amount of viable adhered and detached *P. putida* reached 10³-10⁵ CFU per gram of Quaternary clay granules and about 10⁶ CFU per gram of Devonian clay granules. The bactericide effect of Quaternary clay and Quaternary clay granules could be explained with big amount of CaO and MgO.

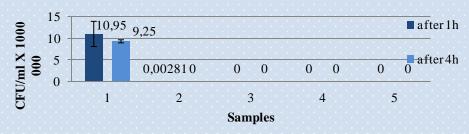


Bacterial viability on dray Devonian clay granules detected with LIVE/DEAD BacLight Bacterial Viability kit

Pseudomonas putida CFUs recovered from dray Devonian clay granules, CFU/g

Conclusion

Obtained results showed, that the kind of clay had important influence on the bacterial adhesion and on the viability of bacteria. Clay from deposit Prometejs (Quaternary clay) is unsuitable for living cell immobilisation because of pronounced bactericide effect. Devonian clay has high potential for living cell immobilization.



Pseudomonas putida CFUs changes in suspension with grounded quaternary clay samples.

References

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