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Crystal-chemical and structural characteristics of modified natural clinoptilolite and correlation between its sorption properties, ion exchange capacity for heavy metals and biological response *in vivo* and *in vitro*

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Кристалохимична и структурна характеристика на модифициран природен клиноптилолит и корелация между сорбционните му свойства, йонообменния капацитет за тежки метали и биологичния отговор *in vivo* и *in vitro*

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Based on the good results obtained from the team from previous studies, it is hypothesized that the additional active sites of the inner surface – pores and channels formed as a result of modification and activation of the clinoptilolite sorbent will increase its sorption capacity compared to natural material, which would increase the detoxification potential and reduce Cd and Pb-induced oxidative stress at the cellular and organism level. In this regard, the following main objectives have been formulated: 1) To develop a methodology for modification and activation of natural forms of clinoptilolite for efficient ion exchange and sorption of lead and cadmium; 2) To elucidate *in vivo* and *in vitro* the effect of modified and activated clino-

ptilolite, and the mechanisms of action in different biological model systems.

The project is a fundamental, interdisciplinary research study, and the results of its implementation are expected to be the basis for solving environmental problems that are essential not only for Bulgaria but also globally. The results of the study will have a significant theoretical contribution to expand knowledge about the properties of clinoptilolite and its ability to reduce the harmful biological effects of certain heavy metals, which are environmental pollutants. In the long run, such products may be used as low-cost detoxifiers in areas with a high level of anthropogenic loading, and contribute to solving important problems related to the environment, quality of life, and health risk in the population.

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