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Fluorescent sensor systems based on nanostructured MIP membranes for selective recognition of mycotoxins

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Fluorescent sensor systems based on nanostructured molecularly imprinted polymer (MIP) membranes were developed and used for the selective recognition of mycotoxins affiliated to aflatoxins in both wheat extracts and waste waters of bread-making plants. The structure of aflatoxin-selective binding sites in the MIP membranes was optimized using the method of molecular dynamics. The MIP membranes capable of highly-selective recognition of aflatoxin B1 were synthesized using a fragment-based approach with ethyl-2-oxocyclopentanecarboxylate as a dummy template and acrylamide/2-acrylamido-2-methyl-1-propansulfonic acid as functional monomers. Triethyleneglycoldimethacrylate was used as a cross-linker. Sensor responses of the fluorescent system were investigated as a function of both type and concentration of the functional monomer in the initial monomer mixture used for the membranes' synthesis, as well as the sample composition. The influence of pH, ionic strength, and buffer concentration on sensor responses was investigated. The fluorescent sensor system based on the optimized MIP membranes provided a possibility of aflatoxin B1 detection within the range 14-500 ng mL^{-1} demonstrating detection limit (3б) of 14 ng mL^{-1}. Extremely high overall selectivity of the sensor systems estimated using close structural analogues of the analyte was demonstrated.

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