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# Investigation of characteristics of urea and butyrylcholine chloride biosensors based on ion-selective field-effect transistors modified by the incorporation of heat-treated zeolite beta crystals

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Urea and butyrylcholine chloride (BuChCl) biosensors were prepared by adsorption of urease and butyrylcholinesterase (BuChE) on heat-treated zeolite Beta crystals, which were incorporated into membranes deposited on ion-selective field-effect transistor (ISFET) surfaces. The responses, stabilities, and use for inhibition analysis of these biosensors were investigated. Different heat treatment procedures changed the amount of Brønsted acid sites without affecting the size, morphology, overall Si/Al ratio, external specific surface area, and the amount of terminal silanol groups in zeolite crystals. Upon zeolite incorporation the enzymatic responses of biosensors towards urea and BuChCl increased up to ~ 2 and ~ 5 times, respectively; and correlated with the amount of Brønsted acid sites. All biosensors demonstrated high signal reproducibility and stability for both urease and BuChE. The inhibition characteristics of urease and BuChE were also related to the Brønsted acidity. The pore volume and pore size increases measured for the heat-treated samples are very unlikely causes for the improvements observed in biosensors' performance, because urease and BuChE are approximately one order of magnitude larger than the resulting zeolite Beta pores. Overall, these results suggest that the zeolites incorporated into the biologically active membrane with enhanced Brønsted acidity can improve the performance of ISFET-based biosensors.

## Biography

Esin Soy has completed her M.Sc. degree at the age of 25 years from Middle East Technical University, Micro and Nanotechnology Department and currently is a Ph.D. student in University of Illinois at Chicago. She is working in the area of biosensing and surface science.

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