

Microfluidic electronic tongue to detect gliadin in foodstuff

Cristiane Margarete Daikuzono¹, Flávio Makoto Shimizu¹, Antonio Riul Jr.²,
Alexandra Manzoli³, Maria Helena Piazzetta⁴, Angelo Luiz Gobbi⁴, Daniel Souza
Corrêa³, Osvaldo Novais Oliveira Jr¹

¹Instituto de Física de São Carlos/Universidade de São Paulo, ²Instituto de Física
Gleb Wataghin, ³Embrapa Instrumentação Agropecuária - São Carlos, ⁴Centro
Nacional de Pesquisa em Energia e Materiais

e-mail: daikuzonocm@gmail.com

The increasing number of reported cases of celiac disease motivates research for the food industry to obtain gluten-free food and detect gluten. Devices for such detection must be portable and easy to use as they will be handled by the consumers themselves. A suitable option is to employ the microfluidic electronic tongue concept[1]. In this study, we fabricated e-tongues to detect gliadin, a protein of gluten present in foodstuffs and responsible for the disease. The sensing units were produced by adsorbing nanostructured films from semiconducting materials using the dynamic self-assembly technique (layer-by-layer)[2] onto microchannels containing interdigitated microelectrodes. Impedance spectroscopy was employed to detect gliadin in synthetic samples, where gliadin was added to an ethanol 70%, and in real food samples. Information visualization methods were used to process the data, which helped distinguish between samples containing different concentrations of gliadin, in addition to determining whether gliadin was present in foodstuff samples. Significantly, no false positives or negatives were observed. The change in the impedance spectra may be associated with gliadin adsorption onto the nanostructured films, according to data from Polarization-modulated infrared reflection absorption spectroscopy (PM-IRRAS) and UV-Vis spectroscopy.

References

[1]C.M.Daikuzono,*et al.*,“Microfluidic electronic tongue,” *Sens. Actuators B Chem.*,207,1129-1135,2015.

[2]H.-J.Kim,K.Lee,S.Kumar, and J. Kim,“Dynamic sequential layer-by-layer deposition method for fast and region-selective multilayer thin film fabrication,” *Langmuir*,21,8532-8538,2005.

Acknowledgement

CAPES,FAPESP,CNPq,INEO.

