World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:11, No:01, 2017

# Detection of Alzheimer's Protein on Nano Designed Polymer Surfaces in Water and Artificial Saliva

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**Abstract :** Alzheimer's disease is responsible for irreversible neural damage of brain parts. One of the disease markers is Amyloid-β 1-42 protein that accumulates in the brain in the form plaques. The basic problem for detection of the protein is the low amount of protein that cannot be detected properly in body liquids such as blood, saliva or urine. To solve this problem, tests like ELISA or PCR are proposed which are expensive, require specialized personnel and can contain complex protocols. Therefore, Surface-enhanced Raman Spectroscopy (SERS) a good candidate for detection of Amyloid-β 1-42 protein. Because the spectroscopic technique can potentially allow even single molecule detection from liquid and solid surfaces. Besides SERS signal can be improved by using nanopattern surface and also is specific to molecules. In this context, our study proposes to fabricate diagnostic test models that utilize Au-coated nanopatterned polycarbonate (PC) surfaces modified with Thioflavin - T to detect low concentrations of Amyloid-β 1-42 protein in water and artificial saliva medium by the enhancement of protein SERS signal. The nanopatterned PC surface that was used to enhance SERS signal was fabricated by using Anodic Alumina Membranes (AAM) as a template. It is possible to produce AAMs with different column structures and varying thicknesses depending on voltage and anodization time. After fabrication process, the pore diameter of AAMs can be arranged with dilute acid solution treatment. In this study, two different columns structures were prepared. After a surface modification to decrease their surface energy, AAMs were treated with PC solution. Following the solvent evaporation, nanopatterned PC films with tunable pillared structures were peeled off from the membrane surface. The PC film was then modified with Au and Thioflavin-T for the detection of Amyloid-β 1-42 protein. The protein detection studies were conducted first in water via this biosensor platform. Same measurements were conducted in artificial saliva to detect the presence of Amyloid Amyloid-β 1-42 protein. SEM, SERS and contact angle measurements were carried out for the characterization of different surfaces and further demonstration of the protein attachment. SERS enhancement factor calculations were also completed via experimental results. As a result, our research group fabricated diagnostic test models that utilize Au-coated nanopatterned polycarbonate (PC) surfaces modified with Thioflavin-T to detect low concentrations of Alzheimer's Amiloid – β protein in water and artificial saliva medium. This work was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) Grant No: 214Z167.

**Keywords :** alzheimer, anodic aluminum oxide, nanotopography, surface enhanced Raman spectroscopy
**Conference Title :** ICBMI 2017 : International Conference on Biosensors and Medical Imaging
**Conference Location :** London, United Kingdom
**Conference Dates :** January 19-20, 2017

Open Science Index, Bioengineering and Life Sciences Vol:11, No:01, 2017 publications.waset.org/abstracts/66120.pdf