

TITLE

Fabrication of TiO₂ nanoparticle thin film on titanium surfaces for application as bacterial sensor/ biochip for rapid, sensitive and direct analysis of pathogenic bacteria using MALDI-MS

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We report the fabrication of a titanium biochip for MALDI-MS produced from a simple, cost effective and rapid heat treatment process. This biochip can be applied for direct analysis of pathogenic bacteria, when immersed into a solution containing pathogenic bacteria. It is able to lead to rapid and sensitive capture the pathogenic bacteria from the solution and hence act as a bacterial sensor. We have optimized the ideal biochip surface showing accelerated capture efficacy as the 800°C heat treated Ti biochip surfaces after studying various surfaces by heating treated at 600°C, 700°C and 900°C. Based on the nature of the TiO₂ nanoparticles which make up the oxide film formed at different temperatures we could increase the bacterial sensing ability of the surface. These biochips could serve dual purposes. (1) They can be applied as MALDI-MS target plates for direct and highly sensitive bacteria analysis. (2) They can be used as on-chip biosensors for direct analysis of the captured bacteria using MALDI-MS. The sensitivity of these chips when used as biosensors is < 10³cfu/mL. The lowest detectable concentration for direct MALDI-MS analysis was found to be 10⁴cfu/mL. The results were further justified by using standard plate counting method combined with Tukey-Kramer statistical analysis and fluorescence imaging followed by image processing for fluorescence quantification using ImageJ to substantiate the MALDI-MS results. The study proposes a promising prospect for these biochips in the capture of bacteria directly from environmental and clinical samples.

Biography

Dr. Judy Gopal, on completion of her PhD in 2006 at Indira Gandhi Centre for Atomic Research, Kalpakkam, India, was directly recruited as Visiting Scientist in the same institute, where she worked in the Materials development laboratory upto 2009. In 2010 she left for Taiwan to join the Department of Chemistry, National Sun Yat Sen University as National Science Council post doctoral fellow where she continues till date. She has more than 30 publications in standard SCI journals. Judy has more than 10 paper presentation - technical excellence awards in various international conferences and young achiever awards to her credit.