

EFFECTS OF SURFACE PROPERTIES AND CELL SIZE ON ADHESION OF BACTERIA ON SILICON NITRIDE SURFACES

Praphaphan Wipatawit¹, Worapath Bhodiyaraja², Chananuch Charoenvijitchai², Kanta Keawklad² & Phanida Saikhwan^{2*}

¹ Thai Microelectronics Center, National Electronics and Computer Technology Center, Prathumthani, Thailand

² Department of Chemical Engineering, Faculty of Engineering, Thammasat University, Klong 1, Klong Luang, Pathum Thani, 12121, Thailand

ABSTRACT

The effects of surface energy, surface roughness and cell size on initial bacterial adhesion on nanosurface, silicon nitride (Si₃N₄), were investigated. Three bacteria of different sizes used in the investigation were S. aureus (~1 μm diameter), E. coli (~1x4 μm) and B. cereus (0.8x3 μm). The surface energy and surface roughness were measured before and after a series of cell adhesion experiments. It was found that surface energy (range of 39-44 mJ/m²) and surface roughness (3<Rq<21) had no significant effect on cell adhesion. In addition, it was found that uneven distribution of peaks on surface could increase cell adhesion. Regarding cell size, cell adhesion seemed to increase with surface area of cells. Although using Si₃N₄ could reduce overall cell adhesion, surface energies of Si₃N₄ after bacterial adhesions exhibited more variation than the surface energy of glass.