

Novel Nanostructured Organosilicate Nanoparticle Coatings for Chem-Bio Sensing

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We present novel nanostructured organosilicate particulate based films and demonstrate that these materials have a great potential for chemical-biological sensor development. With unprecedented high surface areas ($> 1400 \text{ m}^2/\text{g}$) and optical transparency together with its easy surface functionalization, these materials can be readily interfaced with existing immunoassays for the rapid and trace detection of both chemical and biological warfare agents. The ultra high surface area associated with these films stems from its unique nanostructure consisting of nanoparticles (2-5nm) in a “raspberry” structure in combination with interconnected nanopores (3-10nm). This unique nanostructure has been exploited to immobilize high areal density of sensor probes to improve the sensing performance. Two orders of magnitude increase in binding density was achieved when fluorescently tagged protein A molecules were immobilized upon these surfaces compared to flat substrates (glass and Silicon). Our on-going work applies these materials to develop platforms for multiplexed sensitive detection of biological and chemical agents at point of care for both army and civilian use.