

Displacement Immunosensor Based on Surface Plasmon Resonance for Rapid and Highly Sensitive Detection of 2,4,6-Trinitrotoluene

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By making use of the antigen-antibody interaction and a surface plasmon resonance (SPR) sensor, we developed a measurement procedure of displacement immunoassay to rapidly detect 2,4,6-trinitrotoluene (TNT). In this procedure, TNT solutions were injected in 30 s at the end of flowing an anti-TNT antibody. Three kinds of sensor surfaces were modified with TNT analogues, namely, TNP-glycine, DNP-glycine, and DNP-acetic acid in a self-assembled monolayer containing ethylene glycol. We investigated which of the TNT analogues provided higher sensitivity using the displacement immunosensor. As a result, the limit of detection (LOD) of TNT was 0.4 ng/mL (ppb) when using the DNP-glycine-modified Au sensor surface with a one-minute flow of TNT solution. We concluded that the final TNT LOD was 0.9 ppb on the basis of experiments using the three different DNP-glycine-modified sensor surfaces. The LOD was 0.7 ppb when using the sensorgram slope 10 s after TNT injection. The displacement immunosensor can detect TNT at sub-ppb levels in 12 s.

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