Platelet-derived growth factor oncoprotein detection using three-dimensional carbon microarrays

Abstract

The potential of aptamers as ligand binding molecule has opened new avenues in the development of biosensors for cancer oncoproteins. In this paper, a label-free detection strategy using signaling aptamer/protein binding complex for platelet-derived growth factor (PDGF-BB) oncoprotein detection is reported. The detection mechanism is based on the release of fluorophore (TOTO intercalating dye) from the target binding aptamer's stem structure when it captures PDGF. Amino-terminated three-dimensional carbon microarrays fabricated by pyrolyzing patterned photoresist were used as a detection platform. The sensor showed near linear relationship between the relative fluorescence difference and protein concentration even in the sub-nanomolar range with an excellent detection limit of 5 pmol. This detection strategy is promising in a wide range of applications in the detection of cancer biomarkers and other proteins.