ULTRASENSITIVE AND HIGHLY SELECTIVE DETECTION OF ALZHEIMER’S DISEASE BIOMARKER USING TWO-PHOTON RAYLEIGH SCATTERING PROPERTIES OF GOLD NANOPARTICLE

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Abstract: Alzheimer’s disease (AD) is a progressive mental disorder disease, which affects 26.6 million people in worldwide and estimated increments can be 100 million by 2050. Despite the huge problems, there is no definitive diagnosis of AD, other than postmortem identification. Since there is no cure at present, early diagnosis of AD is crucial for the current drugs treatments. Driven by the need, here we demonstrate for the first time that monoclonal anti-tau antibody coated gold nanoparticle based two-photon scattering assay can be used for the detection of Alzheimer's tau protein in 1 pg/mL level which is about two orders of magnitude lower than cut-off values (195 pg/mL) for tau protein in CSF (cerebrospinal fluid). We have shown that when anti-tau antibody coated gold nanoparticle were mixed with 20 ng/ml of tau protein, two-photon scattering intensity increases by about 16 times. The mechanism of TPRS intensity change has been discussed. Our data demonstrated that our TPRS assay is highly sensitive to Tau protein and it can distinguish from BSA, which is one of the most abundant protein components in CSF. Our results demonstrate the potential for a broad application of this type of nano-bionanotechnology in practical biomedical applications.

Keywords: Alzheimer’s Biomarker, gold nanoparticle, Tau Protein, two-photon Rayleigh scattering, plasmonics