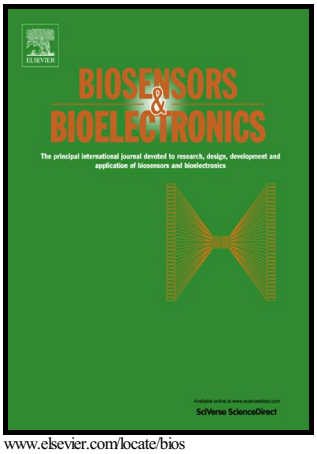

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Direct detection of two different tumor-derived extracellular vesicles by SAM-AuNIs LSPR biosensor

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Abstract
Extracellular vesicles (EVs) are abundant in various biological fluids including blood, saliva, urine, as well as extracellular milieu. Accumulating evidence has indicated that EVs, which contain functional proteins and small RNAs, facilitate intercellular communication between neighbouring cells, and are critical to maintain various physiological processes. In contrast, EV-derived toxic signals can spread out over the tissues adjacent to the injured area in certain diseases, including brain tumors and neurodegenerative disorders. This demands better characterization of EVs which can be employed for liquid biopsy clinically as well as for the study of intercellular signalling. Exosomes and microvesicles share a number of similar characteristics, but it is important to distinguish between these two types of EVs. Here, we report for the first time that our in-house developed Localized Surface Plasmon Resonance biosensor with self-assembly gold nanoislands (SAM-AuNIs) can be used to detect and distinguish exosomes from MVs isolated from A-549 cells, SH-SY5Y cells, blood serum, and urine from a lung cancer mouse model. Exosomes, compared with MVs, produced a distinguishable response to the bare LSPR biosensor without functionalization, suggesting a different biophysical interaction between exosomes and MVs with SAM AuNIs. This sensor attains the limit of detection to 0.194 µg/ml, and the linear dynamic range covers 0.194-100 µg/ml. This discovery not only reveals great insight into the distinctive membrane property of tumor-derived exosomes and MVs, but also facilitate the development of novel LSPR biosensors for direct detection and isolation of heterogeneous EVs.

Keywords
Biosensor, Exosome, Microvesicles, Extracellular Vesicles, LSPR, Tumor Prognosis.

[1] These authors contributed equally to this work