Supplementary Information

MoS$_2$-MWCNT based Fluorometric Nanosensor for Exosome Detection and Quantification

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Fig. S1 Scanning electron microscopy of MoS$_2$-MWCNT with different magnification in (a) and (b).
Fig. S2 Absorbance of different concentrations of MoS$_2$-MWCNT with a broad absorption band from UV to NIR region, which is a good candidate for PE (R-phycoerythrin) with emission wavelength of 575 nm.
Table S1.
The parameters of general nonlinear Stern-Volmer model for fluorescence quenching of anti-CD63-PE in the presence of MoS$_2$-MWCNT as a quencher

| $K_S$ (mL/mg) | $K_D$ (mL/mg) | f      | n    | $R^2$   |
|--------------|---------------|--------|------|---------|
| 7.724x10^{-8}| 0.02743       | 0.9903 | 3.474| 0.9852  |
| Detection Method                              | Purification Method                  | Detection Time | Limit of Detection | Method Limitation                                                                 | Reference |
|----------------------------------------------|-------------------------------------|----------------|-------------------|-----------------------------------------------------------------------------------|-----------|
| Anodic stripping voltammetric quantification | Total exosome isolation reagent and CD63 antibody-functionalised magnetic beads | >1hr           | $10^5$ exosomes/mL | Not given                                                                        | 1         |
| Aptamer based electrochemical biosensor      | ExoQuick-TC exosome precipitation reagent | 83 min         | $10^6$ exosomes/mL | Not given                                                                        | 2         |
| Colorimetric (mimicking peroxidase ability of single-wall carbon nanotubes) | Ultracentrifugation                 | 40 min         | $5.2 \times 10^8$ exosomes/mL | Susceptible to interference due to developing a “signal-on” strategy to replace “signal-off” strategy | 3         |
| Electrochemical                              | Total exosome isolation reagent      | 60 min         | $4.7 \times 10^8$ exosomes/mL | Not given                                                                        | 4         |
| Nanostructured herringbone chip combined with a sandwich exosome enzyme-linked immunosorbent assay (ELISA) | Exosome capture on the antibody modified chips/ ultracentrifugation | -              | $10^4$ exosomes/mL | Limited preparative sample processing capacity for bulk exosomal content analysis | 5         |
| Microfluidic and fluorescence                | immobilizing vesicles in a microfluidic device (ExoChip) | 70 min         | 0.5 pM            | Not given                                                                        | 6         |
| Electrochemical sandwich immunosensor        | Ultracentrifugation                 | 60 min         | $2 \times 10^5$ exosomes/mL | Long incubation times and multi-steps process                                    | 7         |
| Fluorescence                                 | Total exosome isolation reagent      | 60 min         | $14.8 \times 10^5$ exosomes/mL | Susceptible to influence from nonspecific interactions of antibodies           | This work |

Table S2
Comparison of the Limit of Detection (LOD) and Detection Time of Different Methods for Exosome Determination
Fig. S3  Zeta potential of MoS$_2$-MWCNT nanocomposites (a) before and (b) after adding anti CD63-PE, which shows a significant decrease in the zeta potential value and confirms the adsorption of anti CD63-PE on MoS$_2$-MWCNT.
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