Towards antibody mediated bio-sensing by means of immobilized MoS_2 nanoflakes

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Abstract

The two-dimensional transition metal dichalcogenide nanoflakes exhibit several unique properties such as tunable energy band gap, high electron mobility, low toxicity and stability in liquid media which are highly attractive for bio-sensing applications.

We present a method of the antibody mediated bio-sensing by means of MoS_2 nanoflakes immobilized on silicon substrate. The nanoflakes are covalently bonded to the substrate, being ready for further functionalization by surface-reactive poly (ethylene glycol) derivates (PEGs). By bonding a LA-PEG-biotin compound to the MoS_2 surface, the functionalized nanoflake becomes a platform for the formation of highly specific biotin-avidin complex. We tracked the formation of such biotin-avidin complex in real time by in situ imaging ellipsometry complemented by ex situ AFM measurements.

As it can be seen from Fig. 1C, the avidin-terminated MoS_2 nanoflake allows to immobilize and detect a large number of biotinylated antibodies due to the specificity of the antigen-antibody coupling. In the free-standing form, such MoS_2 nanoflakes can be utilized for targeted drug delivery.

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References

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Figures

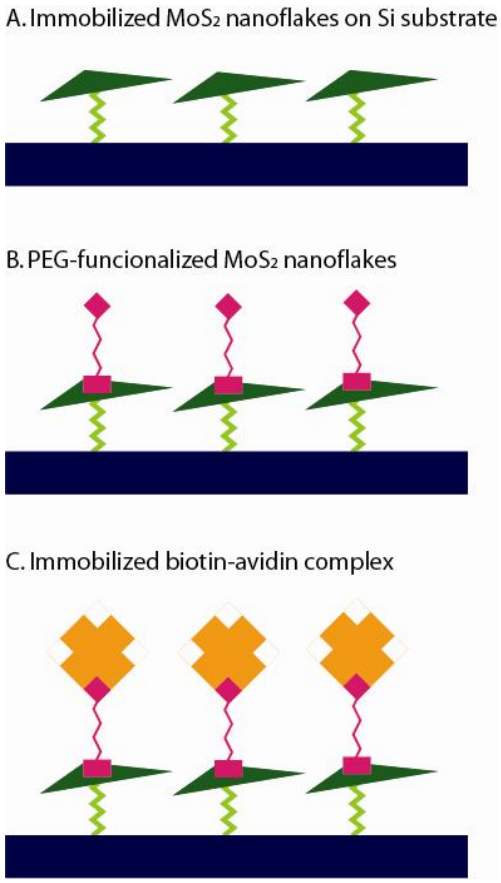

Figure 1: Biotin-avidin complex immobilization on immobilized MoS_2 nanoflakes