Electronic Supplementary Information

Dendrimer Matrix for Performance Enhancement of Evanescent Wave Absorption based Fiber-Optic Biosensor

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Fig. S-1 Calibration curve of FITC molecules in tri-sodium phosphate buffer solution.

S-1: Algorithm used for average height calculation and peak detection for AFM images in MATLAB 6.5.



S-2: Surface area calculation for sensor matrix

Since, there was no significant change in average height of bare glass $(1.83 \pm 0.18 \text{ nm})$, silane $(1.85 \pm 0.26 \text{ nm})$ and CDI $(1.83 \pm 0.18 \text{ nm})$ coated surfaces, it was assumed that the surface area is nearly same (surface area for 1 um × 1 um of sensor surface = 1 μ m²) for these three surfaces. In contrast, average height was found 3.65 ± 0.43 nm for dendrimer matrix due to globular shape of dendrimer. Due to this, there was a definite increase in surface area of dendrimer matrix. The surface area was calculated by assuming all the features having ellipsoid shape as shown in Fig. S-2.



Fig. S-2 A schematic of ellipsoid structure

The dimensions a and b were taken as radius of dendrimer molecule which is nearly 2.25 nm as reported in literature [1,2]. The peak height, i.e. h, was calculated by image analysis using MATLAB. Thereafter, the surface area (S) of half ellipsoid (only the upper half ellipsoid will be available for bioconjugation) was calculated as per given formula.

$$S \approx 2\pi [(a^{p}b^{p} + a^{p}h^{p} + b^{p}h^{p})/3]^{1/p}$$

where p = 1.6075

Finally, total area of the sensor surface was calculated by the following formula:

Total surface area = surface area of bare glass surface + area of all half ellipsoid features - surface area of ellipsoidal circle (i.e. area beneath the dendrimer molecules)

For example, assume a 1 um \times 1 um dimension of glass surface on which dendrimer was immobilized. Now, assume n peaks were detected by the peak detection algorithm in MATLAB in the height range from Avg height – SD to Avg height + SD. Let the heights of these peaks be $h_1, h_2...h_n$.

$$S_n \approx 2\pi [(a^p b^p + a^p h_n^p + b^p h_n^p)/3]^{1/p}$$

 $\sum S = S_1 + S_2 + S_3 \dots S_n$

Total surface area = $1 + \sum S - n.\pi ab$



Fig. S-3 Absorbance spectra of FITC-HIgG antibody solution (conc. = $100 \ \mu g/mL$) exhibiting the excitation peak at 495 nm.



Fig. S-4 Time-resolved absorbance response obtained from rabbit IgG antibodies coated silanized $(-\bullet-)$ and dendrimerized $(-\bullet-)$ sensor matrices when incubated with nonspecific analyte, i.e. FITC-GaHIgG (conc. = 10 µg/mL).

References:

- 1. Li J, Piehler LT, Qin D, Baker JR, Tomalia DA (2000) Langmuir 16:5613–5616.
- 2. Scott RWJ, Wilson OM, Crooks RM (2005) J Phys Chem B 109:692-704.