

**Electronic Supplementary Material (ESI) for New Journal of Chemistry.**

**Supplementary Information**

**Highly Dispersible Silica pH Nanosensor with Expanding Measurement Range**

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Table S 1 The Specific surface area of SNP.

| Plot data          | Adsorption branch                        |
|--------------------|------------------------------------------|
| $V_p$              | 0.5605[cm <sup>3</sup> g <sup>-1</sup> ] |
| $r_{p,peak}(Area)$ | 12.24[nm]                                |
| $a_p$              | 167.28[m <sup>2</sup> g <sup>-1</sup> ]  |

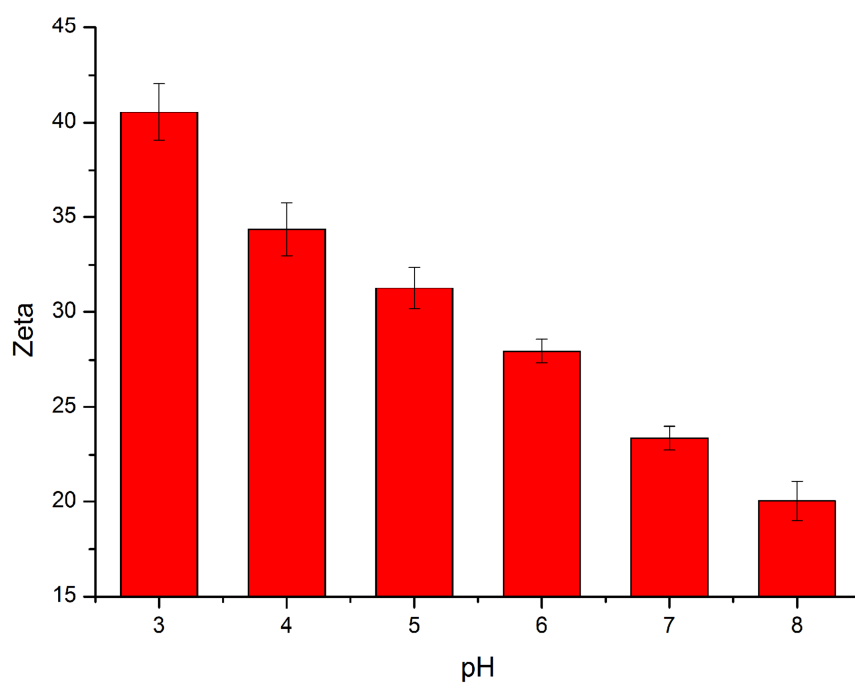


Figure S 1 The zeta potential of SNP-NH<sub>2</sub> at different pH values.

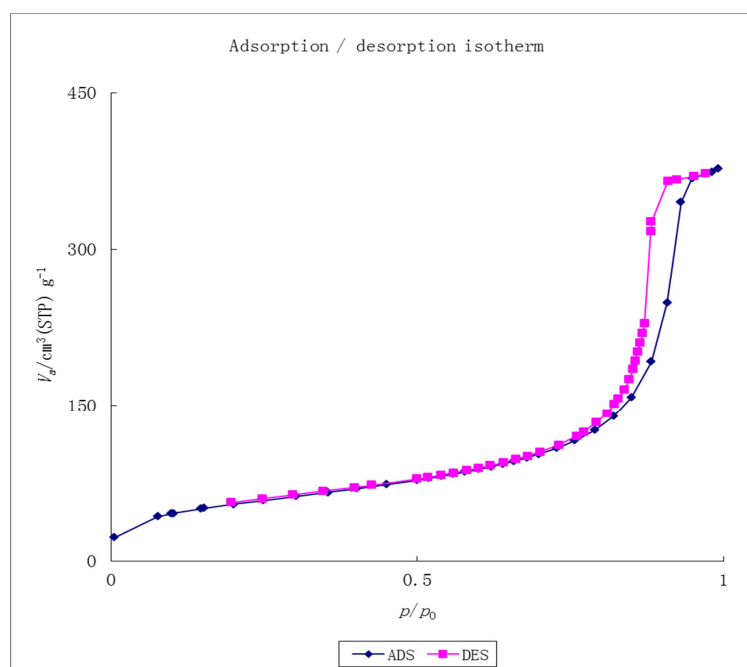


Figure S 2 Nitrogen adsorption/desorption isotherms of SNP.

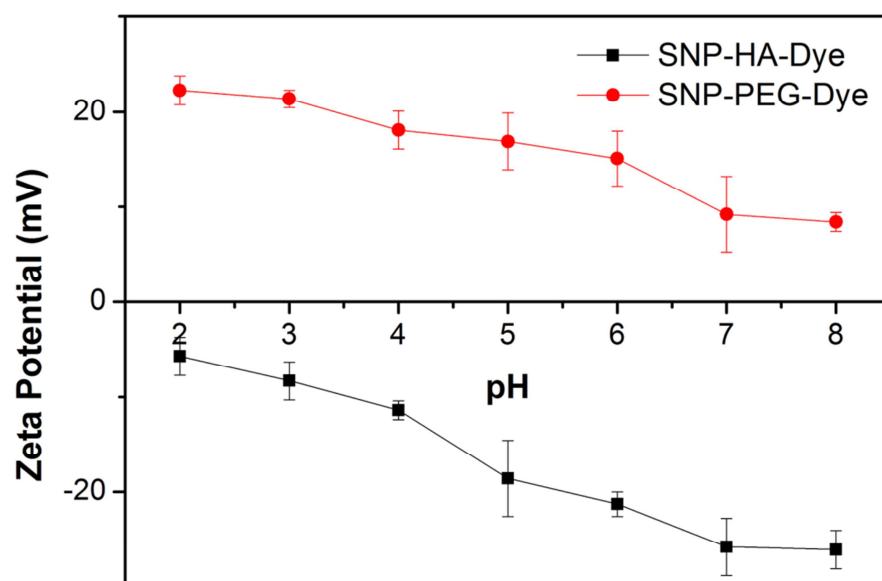


Figure S 3 The zeta potential of the complete sensors at different pH values.

Table S 2 The stability of Polymer coated nanoparticles in water and buffer (0.1M).

|                  |       | 24 hours |       | 1 week |       | 2 weeks |       | 3 weeks |       |
|------------------|-------|----------|-------|--------|-------|---------|-------|---------|-------|
| Samples          |       | Size     | PDI   | Size   | PDI   | Size    | PDI   | Size    | PDI   |
|                  |       | (nm)     |       | (nm)   |       | (nm)    |       | (nm)    |       |
| SNP-PEG in water |       | 104.9    | 0.112 | 110.6  | 0.132 | 102.2   | 0.190 | 113.6   | 0.102 |
| SNP-Dye -PEG     | water | 86.30    | 0.146 | 90.30  | 0.126 | 82.65   | 0.160 | 88.31   | 0.177 |
|                  | pH3.0 | 113.4    | 0.224 | 116.1  | 0.154 | 110.1   | 0.201 | 113.9   | 0.264 |
|                  | pH3.8 | 103.6    | 0.221 | 100.2  | 0.241 | 107.4   | 0.266 | 105.2   | 0.245 |
|                  | pH4.6 | 119.8    | 0.195 | 107.6  | 0.231 | 109.1   | 0.205 | 117.8   | 0.184 |
|                  | pH5.4 | 100.8    | 0.270 | 105.5  | 0.250 | 113.8   | 0.225 | 108.4   | 0.253 |
|                  | pH6.2 | 92.17    | 0.244 | 98.27  | 0.266 | 90.45   | 0.213 | 88.93   | 0.319 |
|                  | pH7.0 | 93.73    | 0.364 | 95.31  | 0.344 | 100.3   | 0.264 | 98.11   | 0.371 |
|                  | pH7.8 | 80.31    | 0.323 | 85.23  | 0.257 | 91.21   | 0.314 | 87.43   | 0.241 |
| SNP-HA in water  |       | 76.53    | 0.174 | 80.22  | 0.154 | 75.61   | 0.211 | 77.34   | 0.208 |
| SNP-Dye -<br>HA  | water | 88.64    | 0.171 | 87.43  | 0.197 | 87.00   | 0.217 | 81.32   | 0.231 |
|                  | pH3.0 | 77.20    | 0.144 | 81.12  | 0.114 | 79.30   | 0.163 | 80.33   | 0.251 |
|                  | pH3.8 | 78.61    | 0.139 | 84.22  | 0.209 | 82.13   | 0.188 | 77.98   | 0.212 |
|                  | pH4.6 | 85.33    | 0.211 | 88.43  | 0.241 | 79.48   | 0.198 | 91.02   | 0.233 |
|                  | pH5.4 | 82.32    | 0.274 | 86.12  | 0.261 | 70.99   | 0.206 | 85.23   | 0.272 |
|                  | pH6.2 | 72.11    | 0.194 | 77.45  | 0.252 | 70.31   | 0.189 | 76.41   | 0.217 |
|                  | pH7.0 | 68.58    | 0.264 | 72.67  | 0.313 | 71.64   | 0.309 | 70.06   | 0.354 |
|                  | pH7.8 | 66.15    | 0.213 | 69.93  | 0.301 | 65.13   | 0.297 | 65.11   | 0.377 |

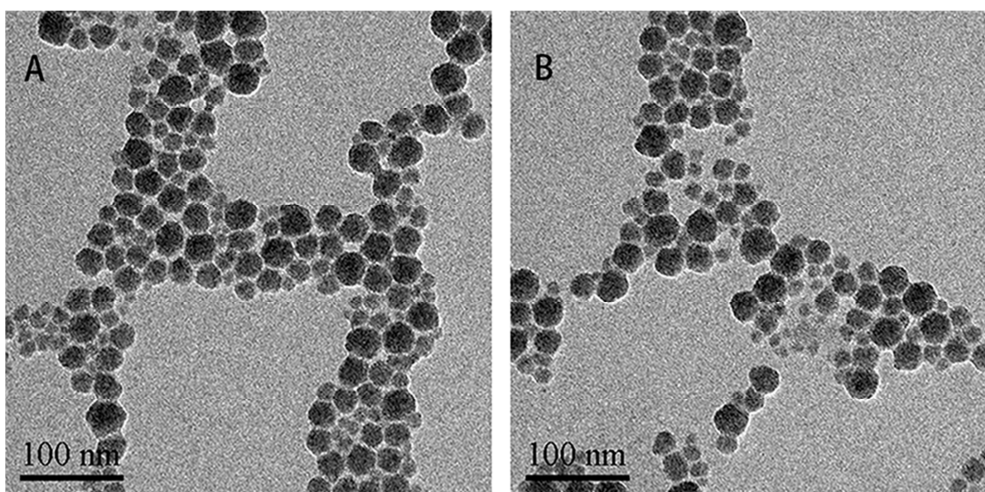


Figure S 4 TEM images of the sensors after kept for 1year in water: SNP-dye-HA (A) and SNP- dye-PEG (B).

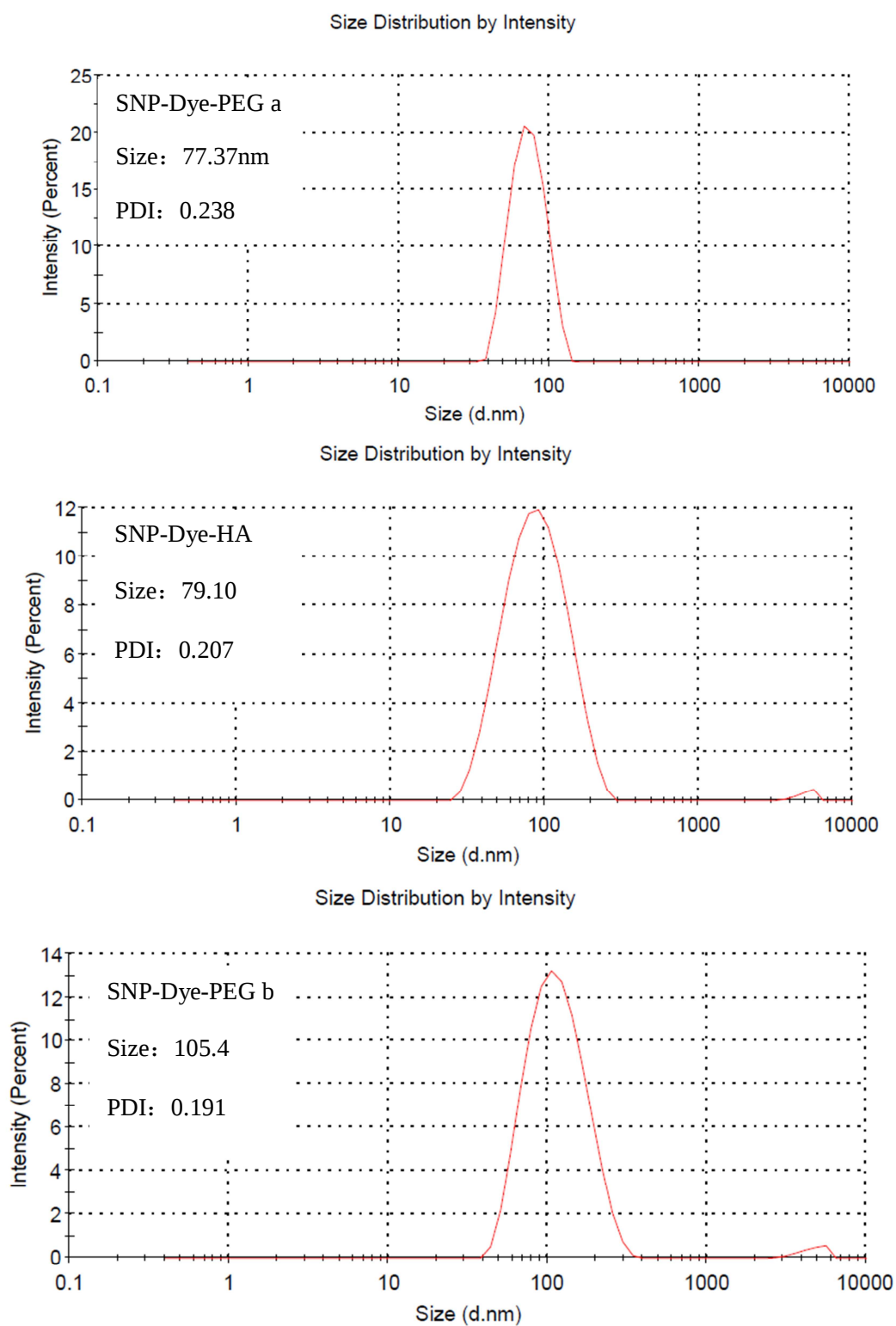


Figure S 5 DLS results of nanosensors after kept for 1year in water