**Supporting information**

# Triangular silver nanoprisms-based chemosensor for recognition of hyaluronic acid in human biofluids: A new platform for monitoring osteoarthritis treatment using smartphone-assisted digital image analysis

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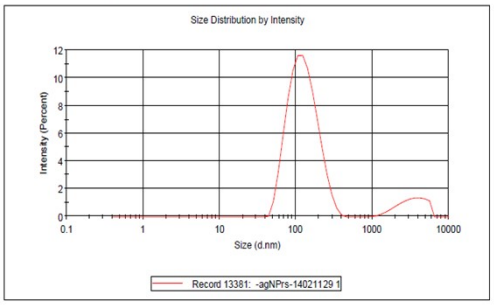
A

Results

| | | Size (d.n... | % Intensity: | St Dev (d.n... |
|---|---|---|---|---|
| Z-Average (d.nm): 110.6 | Peak 1: | 132.2 | 89.5 | 57.53 |
| PdI: 0.406 | Peak 2: | 3407 | 10.5 | 1241 |
| Intercept: 0.830 | Peak 3: | 0.000 | 0.0 | 0.000 |

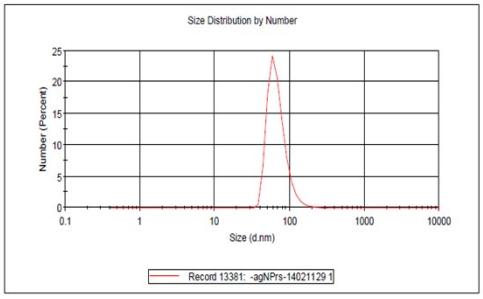
Result quality Refer to quality report




Results

| | | Size (d.n... | % Number: | St Dev (d.n... |
|---|---|---|---|---|
| Z-Average (d.nm): 110.6 | Peak 1: | 68.80 | 100.0 | 22.22 |
| PdI: 0.406 | Peak 2: | 0.000 | 0.0 | 0.000 |
| Intercept: 0.830 | Peak 3: | 0.000 | 0.0 | 0.000 |

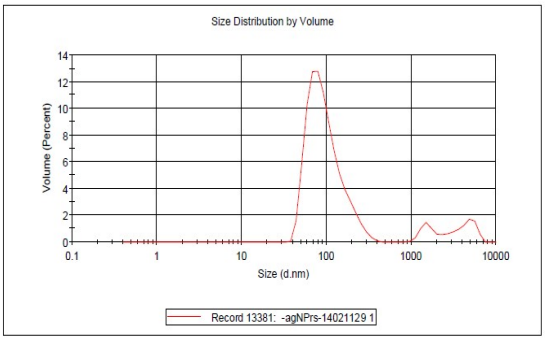
Result quality Refer to quality report




Results

| | | Size (d.nm): | % Volume: | St Dev (d.nm): |
|---|---|---|---|---|
| Z-Average (d.nm): 110.6 | Peak 1: | 101.5 | 86.8 | 52.10 |
| PdI: 0.406 | Peak 2: | 1609 | 5.1 | 349.6 |
| Intercept: 0.830 | Peak 3: | 4308 | 8.1 | 1177 |

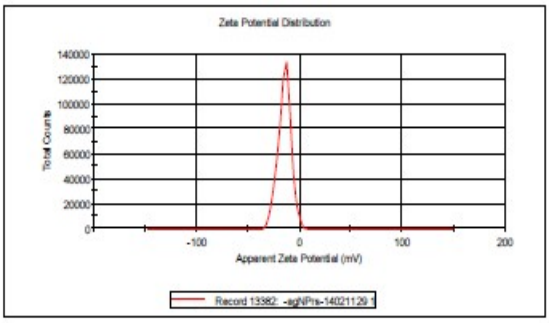
Result quality Refer to quality report




Results

| | | Mean (mV) | Area (%) | St Dev (mV) |
|---|---|---|---|---|
| Zeta Potential (mV): -14.6 | Peak 1: | -14.6 | 100.0 | 6.31 |
| Zeta Deviation (mV): 6.31 | Peak 2: | 0.00 | 0.0 | 0.00 |
| Conductivity (mS/cm): 0.957 | Peak 3: | 0.00 | 0.0 | 0.00 |

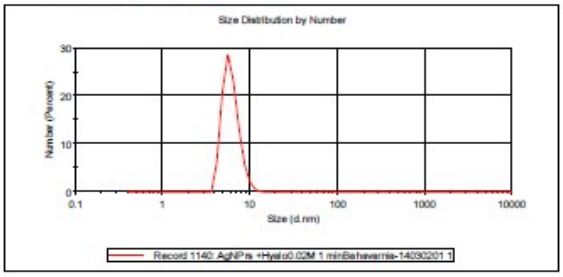
Result quality Good

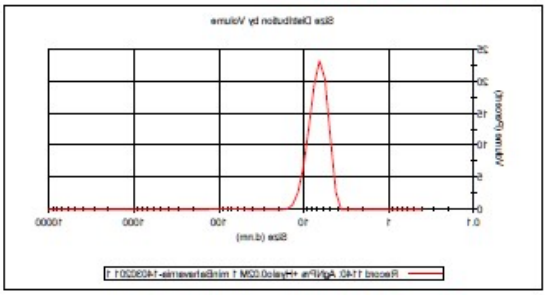


**Results**

| | | Size (d.n... | % Number: | St Dev (d.n... |
|---|---|---|---|---|
| Z-Average (d.nm): 336.0 | Peak 1: | 6.131 | 100.0 | 1.371 |
| PdI: 0.386 | Peak 2: | 0.000 | 0.0 | 0.000 |
| Intercept: 0.471 | Peak 3: | 0.000 | 0.0 | 0.000 |

Result quality Refer to quality report



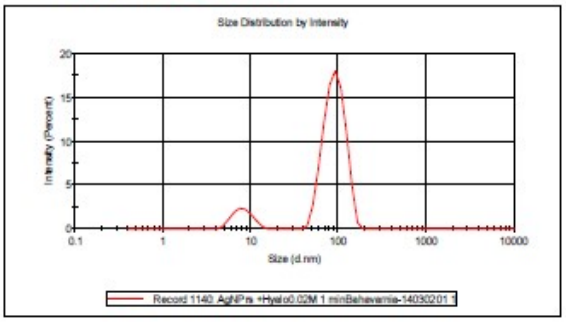



**B**

**Results**

| | | Size (d.n... | % Intensity: | St Dev (d.n... |
|---|---|---|---|---|
| Z-Average (d.nm): 336.0 | Peak 1: | 91.72 | 89.2 | 24.17 |
| PdI: 0.386 | Peak 2: | 8.230 | 10.8 | 2.021 |
| Intercept: 0.471 | Peak 3: | 0.000 | 0.0 | 0.000 |

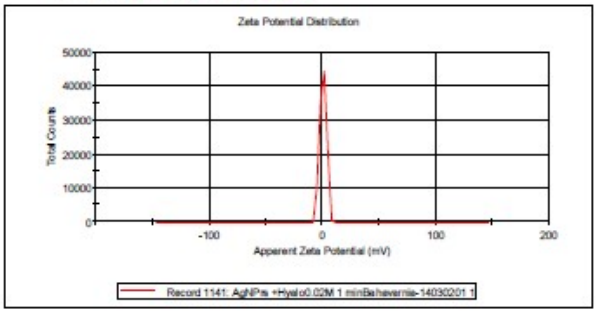
Result quality Refer to quality report




**Results**

| | | Mean (mV) | Area (%) | St Dev (mV) |
|---|---|---|---|---|
| Zeta Potential (mV): 0.749 | Peak 1: | 0.749 | 100.0 | 2.92 |
| Zeta Deviation (mV): 2.92 | Peak 2: | 0.00 | 0.0 | 0.00 |
| Conductivity (mS/cm): 1.21 | Peak 3: | 0.00 | 0.0 | 0.00 |

Result quality See result quality report



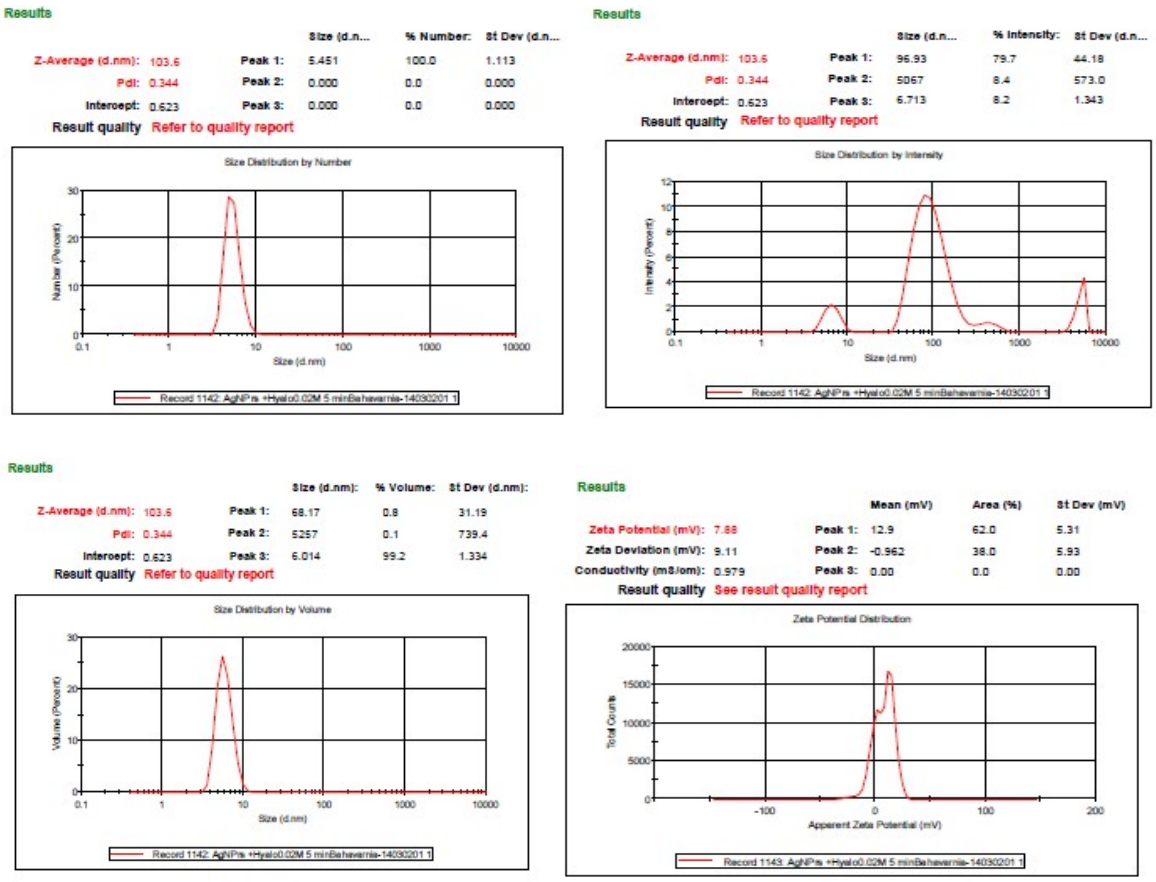



**Fig. S1.** (**A-C**) DLS and Zp of TA-AgNPrs, TA-AgNPrs-HA after 1min reaction time and TA-AgNPrs-HA after 5 min reaction time, respectively.

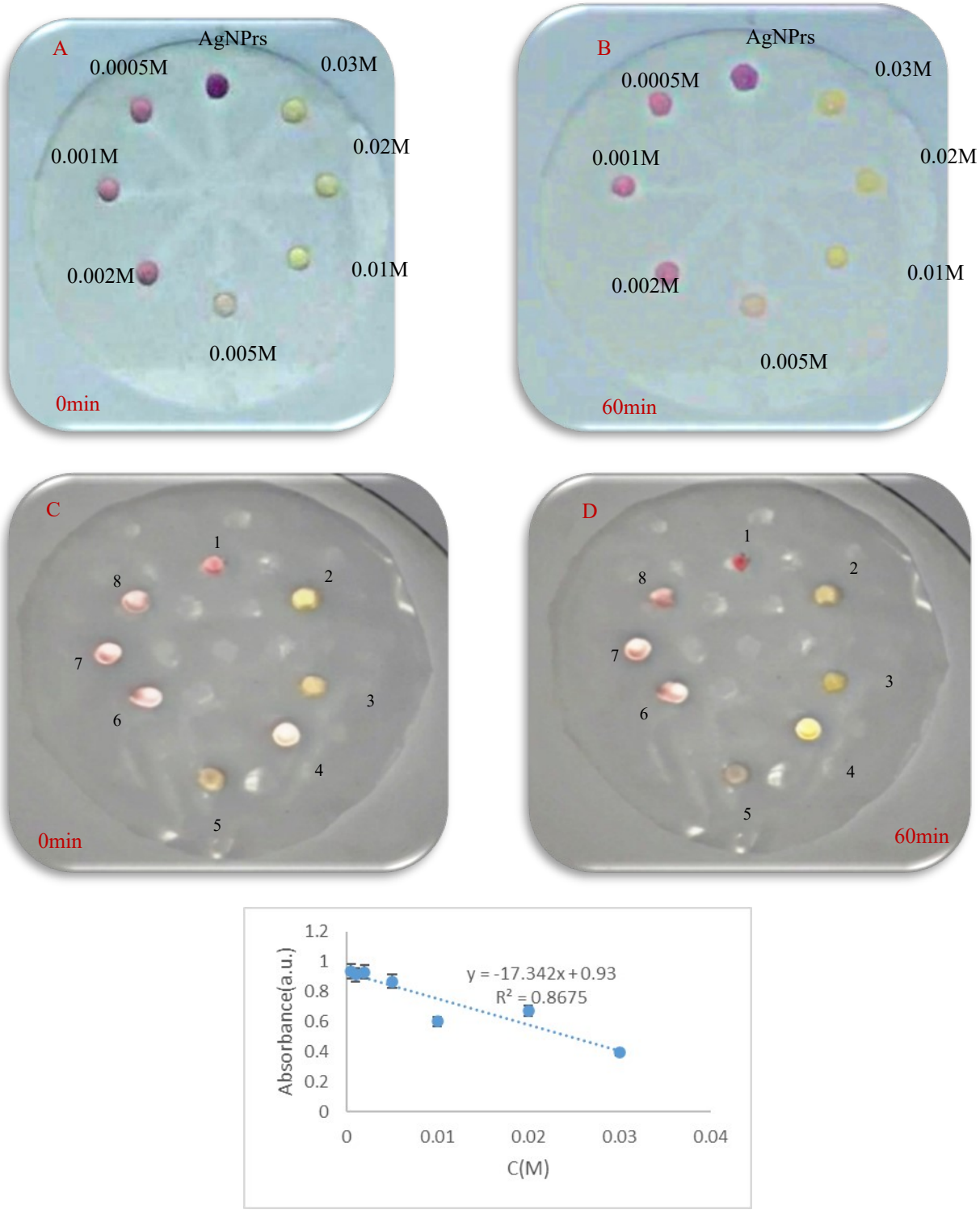



**Fig. S2. (A and B)** High-resolution images of $\mu$PAD for (zone **1)** TA-AgNPrs and **(**zone **2-9)** TA-AgNPrs/HA in different concentration of analyte 0.03, 0.02, 0.01, 0.005, 0.002, 0.001, 0.0005M, respectively, in two incubation times of 0 and 60 min. **(C and D)** High-resolution images of microfluidic parafilm for (zone **1)** AgNPrs and **(**zone **2-9)** TA-AgNPrs/HA in different concentration of analyte 0.03, 0.02, 0.01, 0.005, 0.002, 0.001, 0.0005 M, respectively, , in two incubation times of 0 and 60 min. **E)** Calibration curves obtained by Beer's and Lambert's laws.

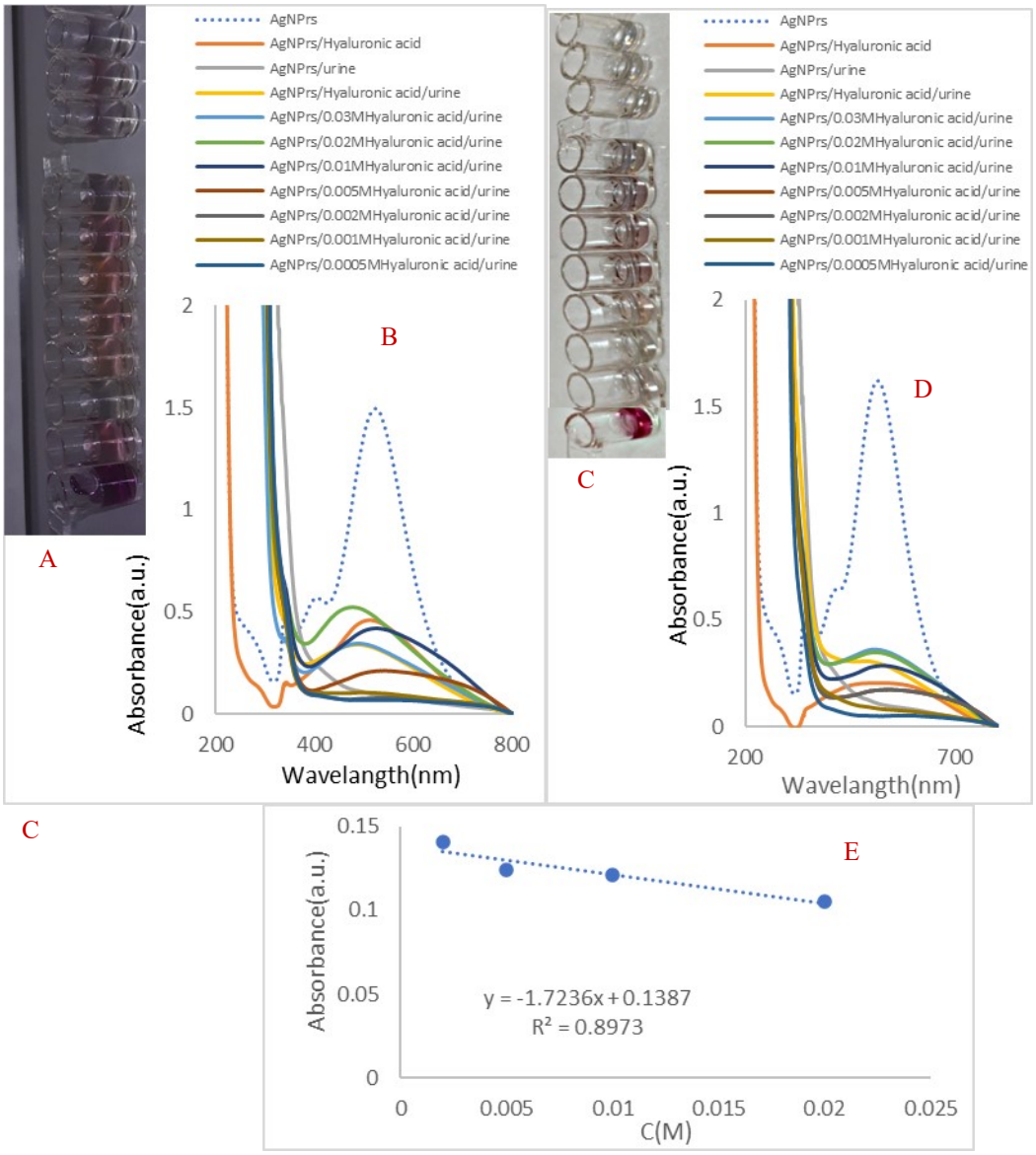



**Fig. S3**. (**A&C**) Photographic images for colorimetric determination of HA (0.03, 0.02, 0.01, 0.005, 0.002, 0.001, 0.0005 M spiked in human urine sample. **B&D)** UV-Vis spectrum of TA-AgNPrs after interaction with different concentrations of HA (0.03, 0.02, 0.01, 0.005, 0.002, 0.001, 0.0005 M). **E)** Calibration curve.

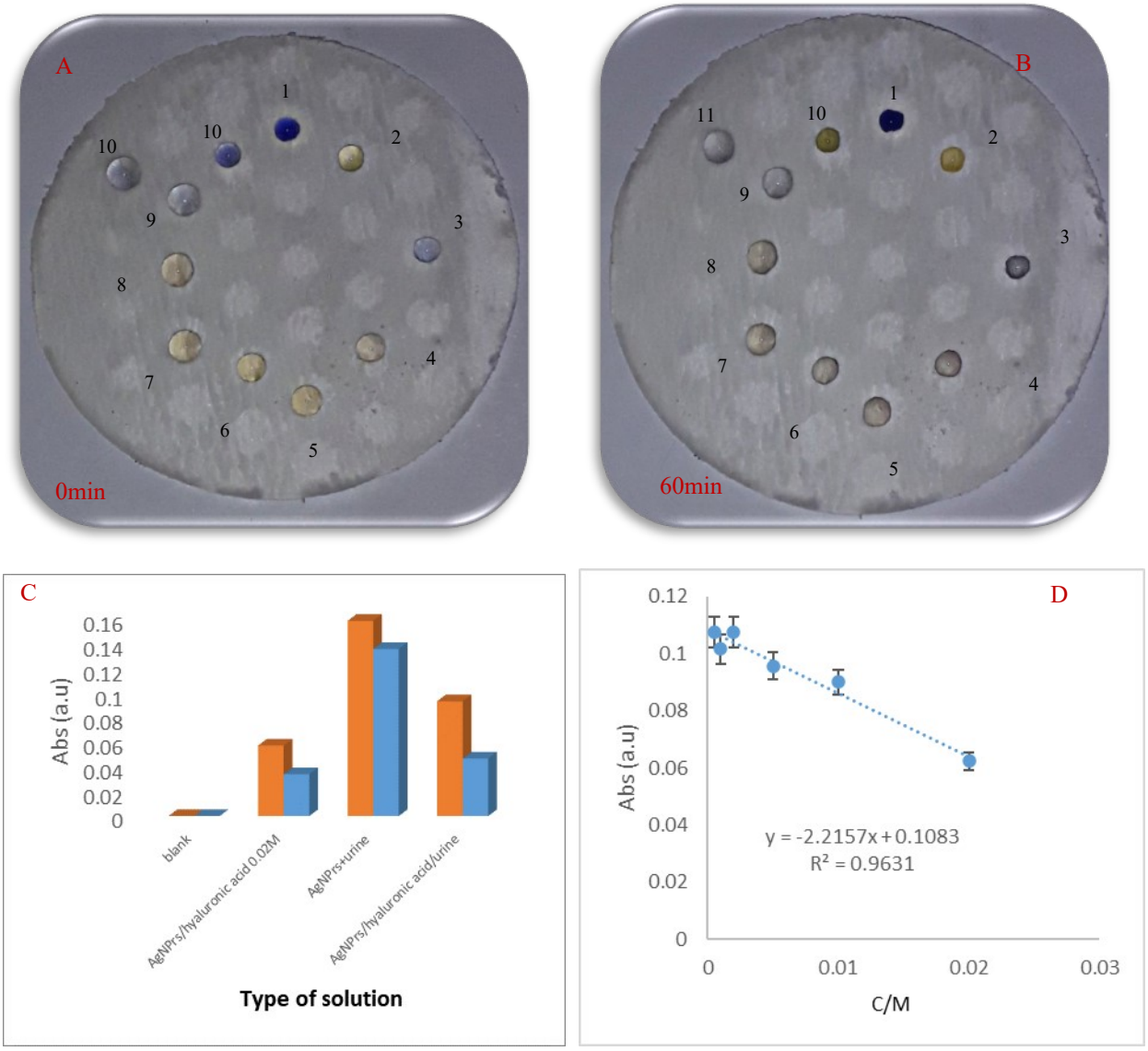



**Fig. S4.** (**A&B**) High-resolution images of µPAD for **(1)** AgNPrs **(2)** AgNPrs/HA, **(3)** AgNPrs/ urine, **(4)** (1:1V/V), **(4)** AgNPrs/ HA /urine, **(5)** AgNPrs/ HA 0.03M +urine, **(6)** AgNPrs/ HA 0.02M +urine, **(7)** AgNPrs/ HA 0.01M +urine, **(8)** AgNPrs/ HA 0.005M +urine, **(9)** AgNPrs/ HA 0.002M +urine, **(10)** AgNPrs/ HA 0.001M +urine, **(11)** AgNPrs/ HA 0.0005M +urine, (1:0.5:0.5 V/V), in reaction time of 0 and 60 min, respectively. **(C)** Histogram curve of the absorbance of optical sensor *versus* type of solution [HA 0.02M /AgNPrs, AgNPrs/urine, AgNPrs/HA/urine] in reaction time of 0 and 60 min, respectively. **(D)**. Calibration curves of the absorbance of chemosensor in urine/ AgNPs/HA.

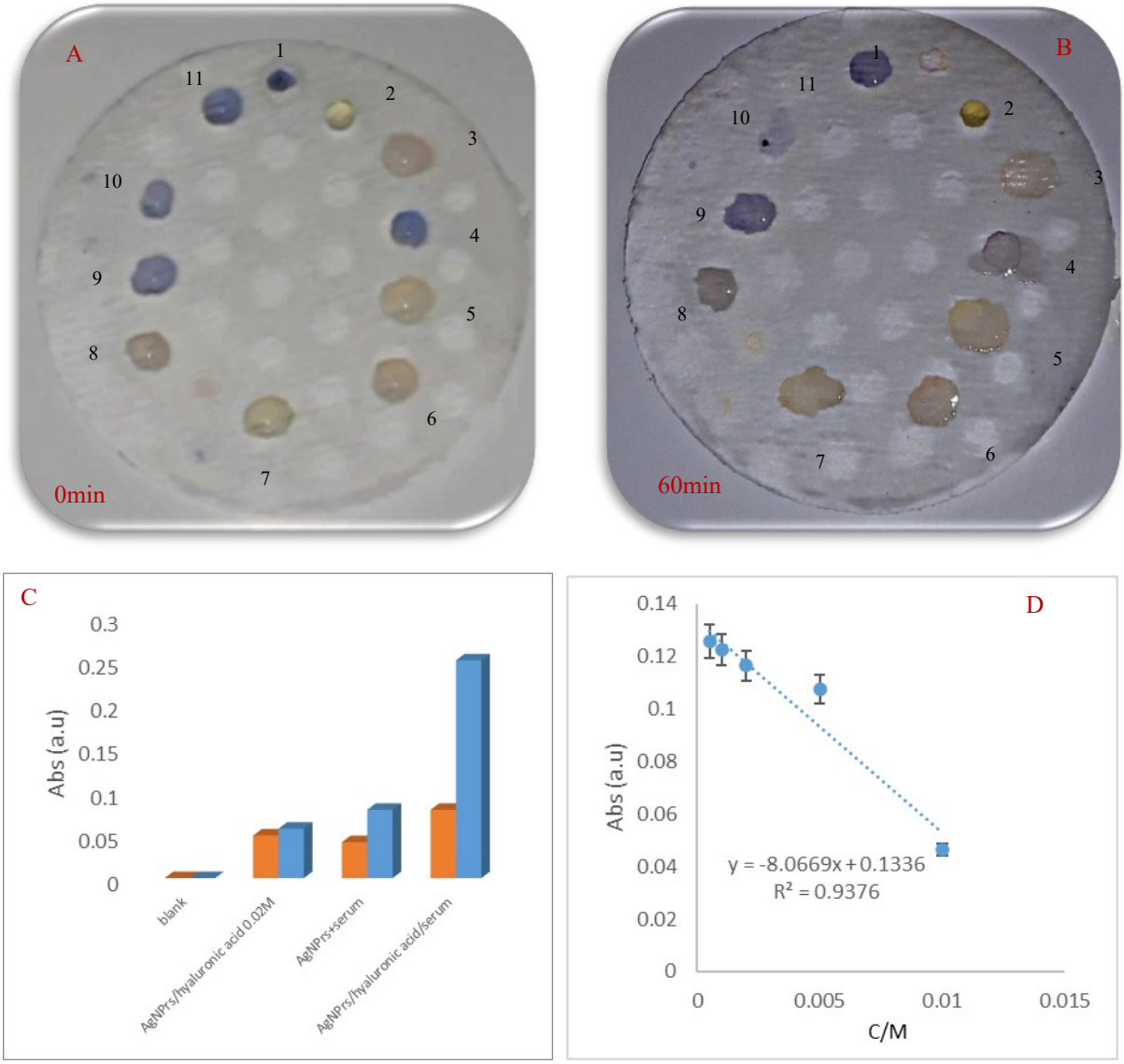



**Fig S5.** (**A&B**) High-resolution images of µPCD for **(1)** AgNPrs **(2)** AgNPrs/HA, **(3)** AgNPrs/ serum, **(4)** (1:1V/V), **(4)** AgNPrs/ HA /serum, **(5)** AgNPrs/ HA 0.03M /serum, **(6)** AgNPrs/ HA 0.02M /serum, **(7)** AgNPrs/ HA 0.01M /serum, **(8)** AgNPrs/ HA 0.005M /serum, **(9)** AgNPrs/ HA 0.002M /serum, **(10)** AgNPrs/ HA 0.001M/serum, **(11)** AgNPrs/ HA 0.0005M /serum, (1:0.5:0.5 V/V), **(A).** High-resolution images of µPAD in reaction time of 0 and 60 min, respectively. **C)** Histogram curve of the absorbance of optical sensor *versus* type of solution [HA 0.02M /AgNPrs, AgNPrs/serum, AgNPrs/ HA /serum] in reaction time of 0 and 60 min, respectively **(D)** Calibration curves of the absorbance of chemosensor in serum/ AgNPs/HA.


**Fig. S6.** High-resolution images of µPCD and Parafilm for **(1)** AgNPrs **(2)** AgNPrs/HA/ Glycine, **(3)** AgNPrs/ HA /Cysteine, **(4)** AgNPrs/ HA /Met, **(5)** AgNPrs/ HA /Pro, **(6)** AgNPrs/ HA /Phenyl, **(7)** AgNPrs/ HA /Aspartic acid, **(8)** AgNPrs/ HA /Ascorbic acid, **(9)** AgNPrs/ HA /Dopamine, **(10)** AgNPrs/ HA /urine (1:0.5:0.5 V/V), **(A, a).** High-resolution images of µPCD in 60min, **(B, b).** High-resolution images of parafilm in various incubation times of 0 and 60min.

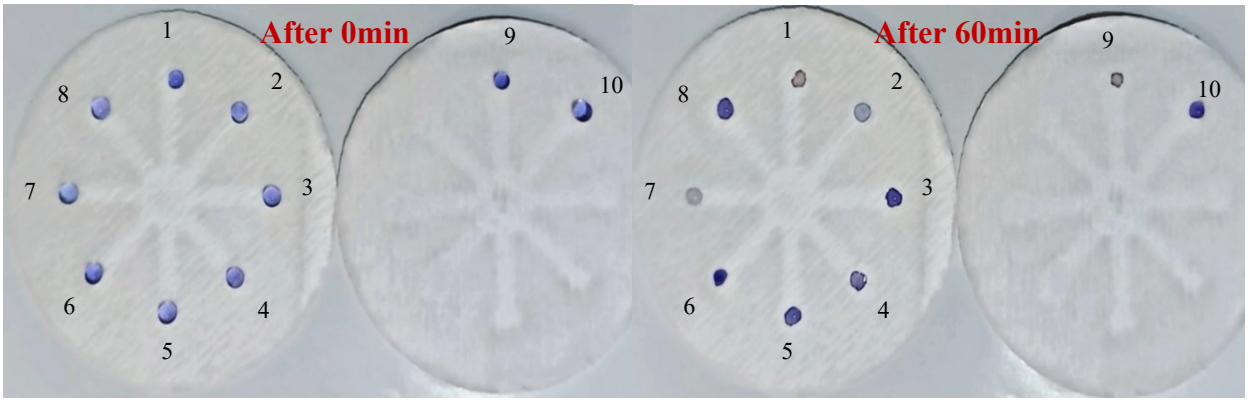



**Fig. S7.** Photographic images of the μPAD at different reaction times. (**1**) AgNPrs, (**2**) AgNPrs + Phe, (**3**) AgNPrs + Gly, (**4**) AgNPrs + Met, (**5**) AgNPrs + Cys, (**6**) AgNPrs + Pro, (**7**) AgNPrs+ Ascorbic, (**8**) AgNPrs + Asp (**9**) AgNPrs + DA (**10**) AgNPrs + UA. Concertation of AA was 10 mM The ration of reagents was (1: 1) v/v in different incubation time of 0 and 60 min.


**Scheme S1**. Photographic images for Paper and parafilm based μPAD fabrication.