Supplementary materials



**Fig. S1.** (a) Zeta potential and (b) particle size of AuNPs after synthesis or after 5 days of storage.

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**Fig. S2.** (a) XRD patterns of the illite, (b) Differential scanning calorimetry (DSC) patterns of illite and muscovite.

**Fig. S3.** SEM micrograph of illite.



**Fig. S4.** (a) Zeta potential of illite, (b) Titration curves of illite and reference solution.



**Fig. S5.** The variation of pH in the adsorption process with time.

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**Fig. S6.** The pH of the system during the adsorption of AuNPs to illite at different citrate concentrations (pH=4.0).

**Table S1.** XRF results of illite and muscovite.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Compositions**  **(wt%)** | SiO2 | Al2O3 | Fe2O3 | MgO | CaO | Na2O | K2O | P2O5 | TiO2 | LOI[[1]](#footnote-1) |
| **Illite** | 43.34 | 36.44 | 1.15 | 1.58 | 0.32 | ‒ | 7.81 | 0.01 | 1.56 | 6.87 |
| **Muscovite** | 46.19 | 30.22 | 5.92 | 1.30 | 0.12 | 0.11 | 11.09 | 0.03 | 0.85 | 4.27 |

LOI denotes loss on ignition.

**Table S2.** Measured Si and Al contents from illite dissolution at different citrate concentrations.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ccitrate (mM)  Ccation (ug/g) | 1 | 2 | 5 | 7.5 |
| Si | 26.16 | 20.64 | 38.46 | 59.96 |
| Al | 5.26 | 5.31 | 18.71 | 35.23 |

**Table S3.** Measured Si and Al contents from illite dissolution at different temperatures.

|  |  |  |  |
| --- | --- | --- | --- |
| T (oC)  Ccation (ug/g) | 5 | 25 | 60 |
| Si | 42.73 | 48.55 | 53.68 |
| Al | 19.18 | 27.03 | 32.09 |

1. [↑](#footnote-ref-1)