Electronic Supplementary Information

Gold nanoparticle-catalyzed uranine reduction for signal amplification in fluorescent assays for melamine and aflatoxin B1

Xu Wang,[a] *Jutta Pauli,*[b] *Reinhard Niessner,*[a] *Ute Resch-Genger* [b] *and Dietmar Knopp** [a]

[a] Chair for Analytical Chemistry, Institute of Hydrochemistry, Technische Universität München, Marchioninistr. 17, D-81377 München, Germany.

[b] BAM Bundesanstalt für Materialforschung und -prüfung, Richard-Willstätter-Str. 11, 12489 Berlin, Germany.

* Corresponding author: dietmar.knopp@ch.tum.de

Characterization of AuNPs

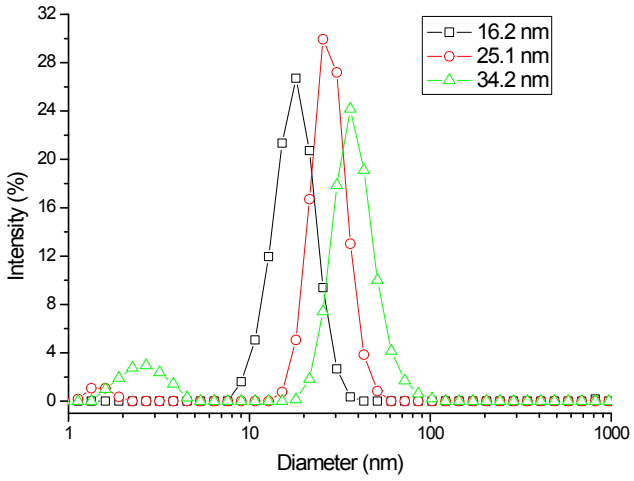

Fig. S1 Size distribution of the prepared AuNPs determined by DLS.

AuNP-catalyzed uranine reduction

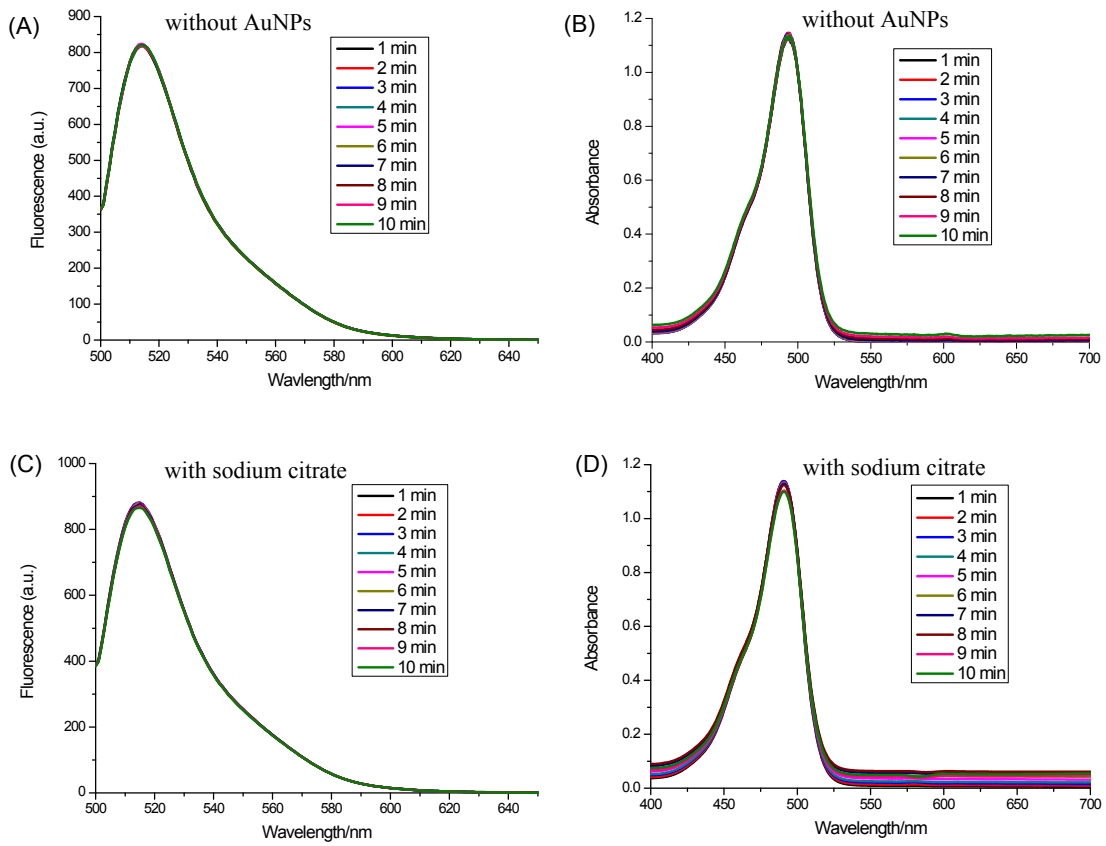

Fig. S2 (A) Time-dependent fluorescence spectra of uranine/$NaBH_4$ (8 μM/10 mM) and (B) UV-vis absorption spectra of uranine/$NaBH_4$ solution (20 μM/10 mM) in the absence of AuNPs. **(C)** Time-dependent fluorescence spectra of uranine/$NaBH_4$ (8 μM/10 mM) and (D) Absorption spectra of uranine/$NaBH_4$ solution (20 μM/10 mM) after addition of 20 μL 1 wt % sodium citrate.

The effect of surface coating

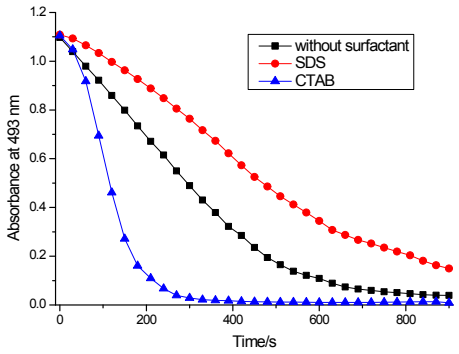

Fig. S3 Time-dependent changes of the absorbance of an uranine/$NaBH_4$ solution (20 µM/10 mM) after addition of AuNPs with different surface coatings. The absorbance was recorded at at 493 nm, i.e., at the absorption maximum of the emissive dianionic form of uranine.

The effect of $NaBH_4$

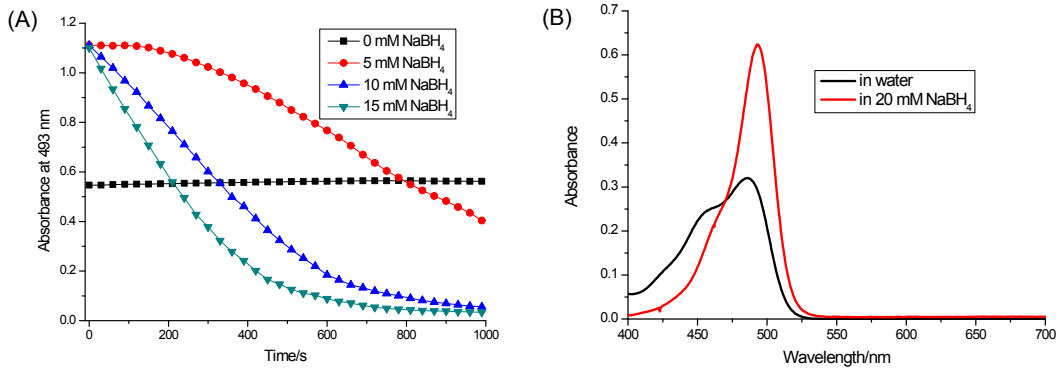

Fig. S4 (A) Effect of different $NaBH_4$ concentrations on the catalytic reduction of uranine (20 µM uranine in 3 mL water, addition of $NaBH_4$ at different concentrations followed by addition of20 µL of 16-nm citrate-stabilized AuNPs). (B) Absorption spectra of uranine (10 µM) in water and in aqueous $NaBH_4$ (20 mM) solution.

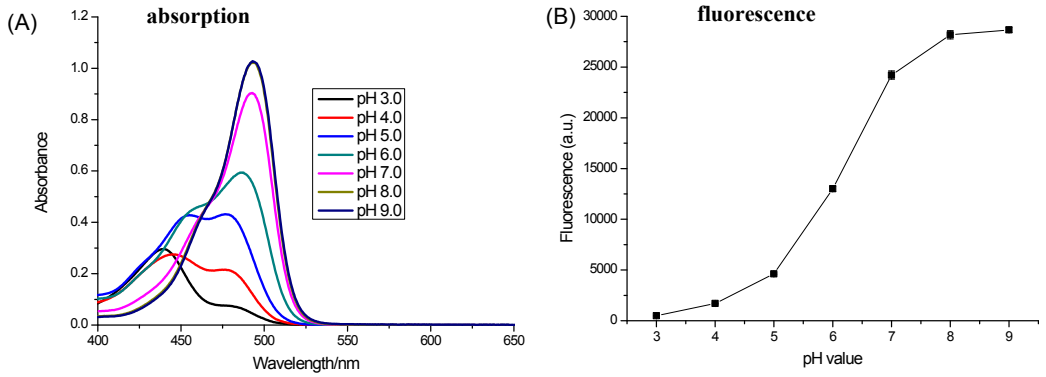

Fig. S5 Effect of pH value on the absorption spectra and fluorescence intensity of uranine. Conditions: 20 µM uranine in buffer with different pH value. The fluorescence was excitated at 485nm and recorded at 528 nm.

The effect of concentration, size and dispersion state of AuNPs

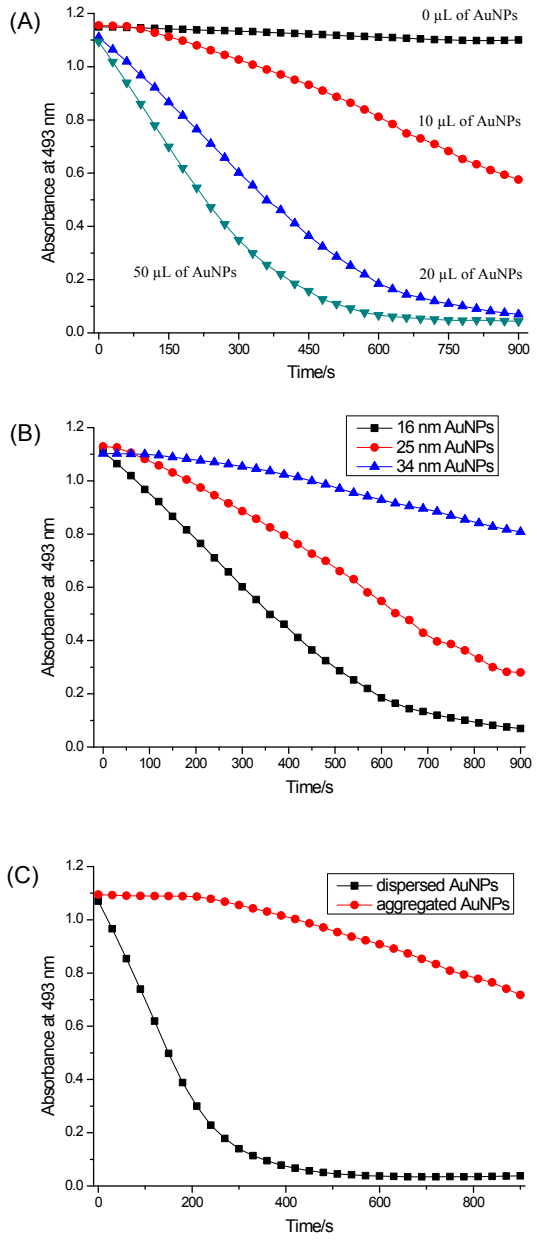

Fig. S6 (A) Effect of AuNP concentration (16-nm AuNPs were used). (B) Influence of AuNP size. [Au] = 0.31 mg/L. (C) Comparison of catalytic activity between dispersed and aggregated AuNPs. Conditions: 20 μM uranine and 10 mM $NaBH_4$ in 3 mL water, and AuNPs with different volumes, sizes or dispersion states were added.

Detection of melamine

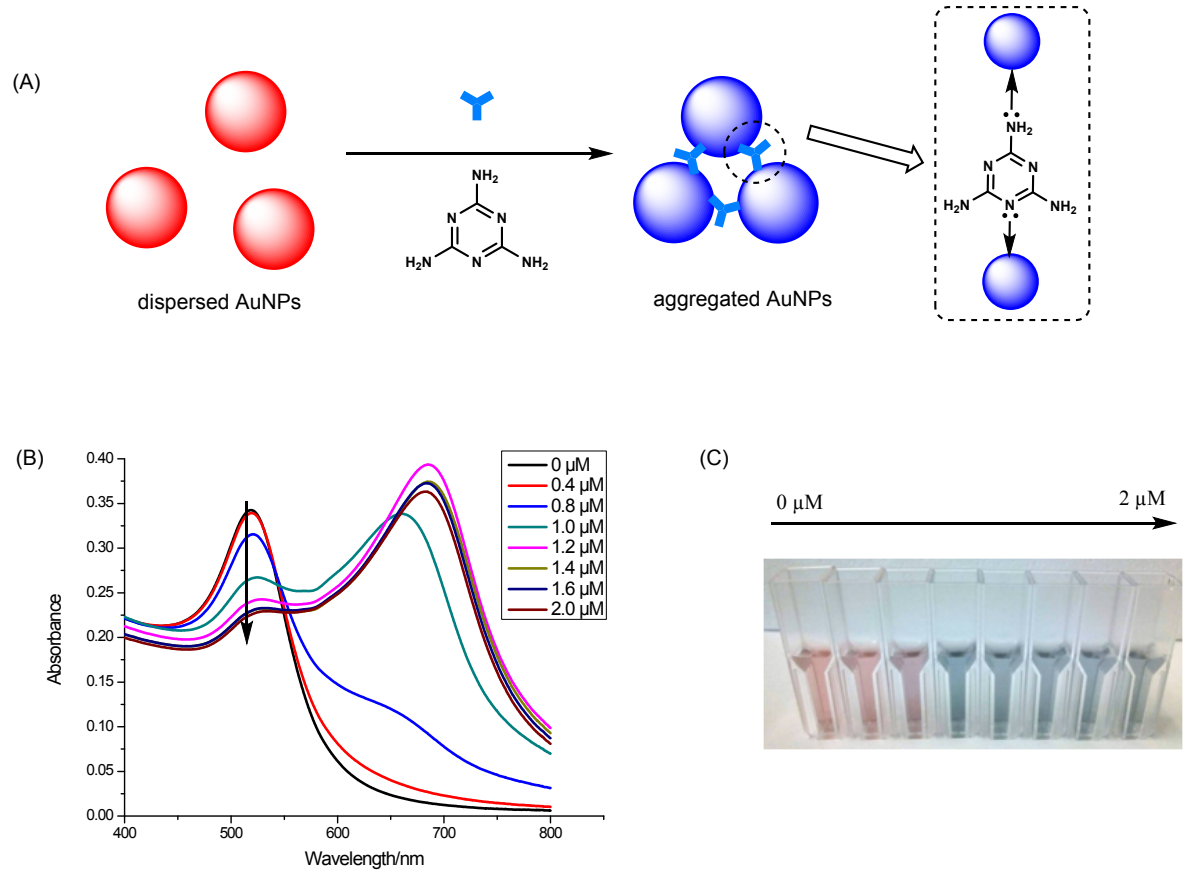

Fig. S7 (A) Schematic illustration of the aggregation of AuNPs induced by melamine. (B) Absorption spectra of AuNPs after addition of melamine with different concentrations and (C) Corresponding image. [Au] = 9.46 mg/L.

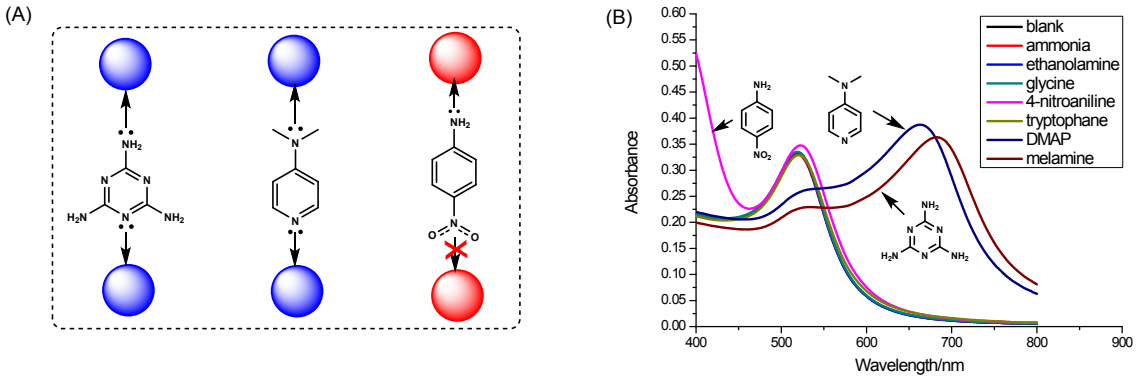

Fig. S8 (A) Schematic illustration of the interactions between AuNPs and amino compounds. (B) Absorption spectra of AuNPs in the presence of different amino compounds. [Au] = 9.46 mg/L.

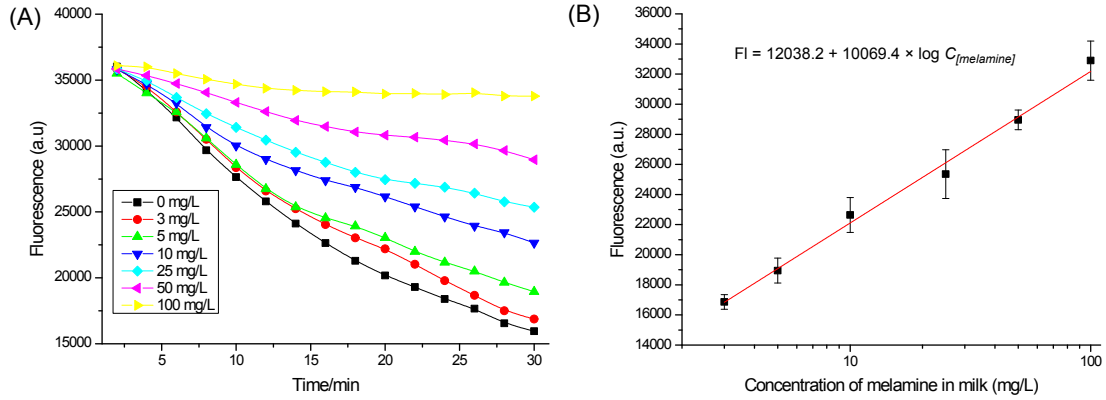

Fig. S9 Kinetic-based fluorescent assay for melamine in milk (λex/λem = 485/528 nm). (A)Time-dependent fluorescence changes, which correspond to different concentrations of melamine. (B) Dependence of the fluorescence intensity at 30 min on melamine concentration in milk. The fluorescence was excited at 485 nm and recorded at 528 nm.

Detection of AFB1

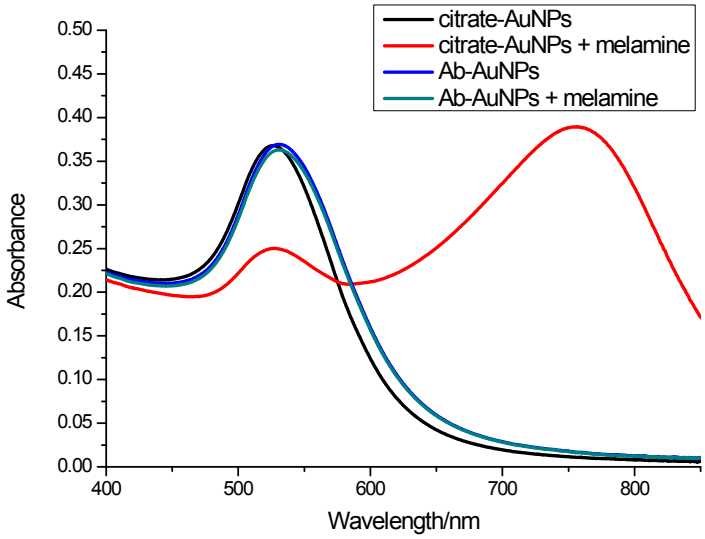

Fig. S10 Absorption spectra of citrate-AuNPs and Ab-AuNPs in the absence/presence of 2 μM melamine. [Au] = 9.46 mg/L.

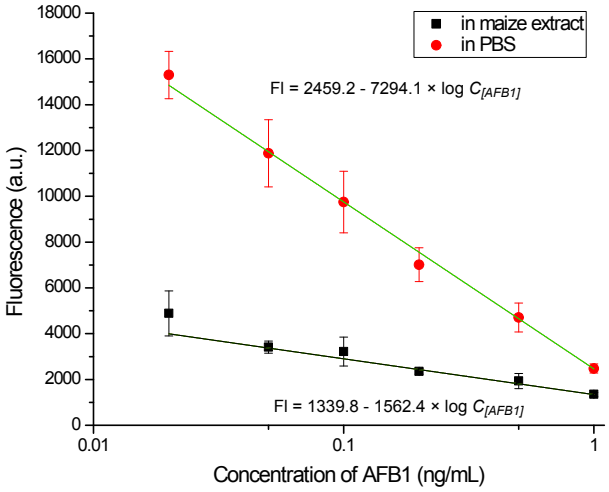

Fig. S11 Dose-response curves of the developed fluorescent immunoassays for the detection of AFB1 in maize extract and in PBS under similar reaction conditions.

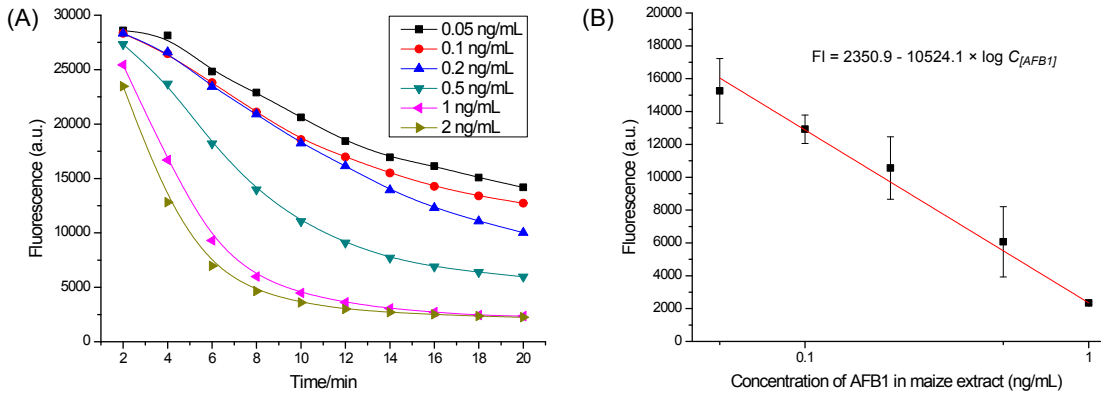

Fig. S12 Kinetic-based fluorescent assay for AFB1 in maize extract (λex/λem = 485/528 nm). (A)Time-dependent fluorescence changes, which correspond to different concentrations of AFB1. (B) The dependence of fluorescence intensity at 20 min on AFB1 concentration in maize extract. The fluorescence was excitated at 485 nm and recorded at 528 nm.

Table S1: The detected results of AFB1 in pulverized maize powders and recovery rates.

Spiked concentration (μg/kg)	After extraction and dilution (μg/L)	Detected concentration (μg/L)	Recovery rate (%)
8	0.10	0.104 ± 0.022	104.0
40	0.50	0.597 ± 0.084	119.4
80	1.00	0.847 ± 0.103	84.7