Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A

SUPPORTING INFORMATION:

Formation of Catalytically Active Gold-Polymer Microgel Hybrids via a Controlled *in-situ* Reductive Process

Garima Agrawal,[a] Marco Philipp Schürings,[a] Patrick van Rijn*[a,b] and Andrij Pich*[a]

[a] Interactive Materials Research DWI an der RWTH Aachen e.V., RWTH Aachen University, Forckenbeckstrasse 50, D-52056 Aachen, Germany. Fax: +49-241-8023317; Phone: +49-241-8023304; E-mail: pich@dwi.rwth-aachen.de

[b] Department of Biomedical Engineering-FB40, W.J. Kolff Institute for Biomedical Engineering and Materials Science, University of Groningen, University Medical Center Groningen, A. Deusinglaan 1, 9713 AV Groningen, The Netherlands. Phone: +31-50-3633141; E-mail: p.van.rijn@umcg.nl

S1

pH-dependent DLS and zeta-potential measurements

We expect that because of the presence of acid groups the pH of the aqueous phase will influence the dimension of the microgel particles. **Fig. S1a** shows the hydrodynamic radii of different microgel samples as a function of pH. Increase in the pH leads to the swelling of microgel particles due to the strong electrostatic repulsion between the charged AAc groups. Contrary, the hydrodynamic radius of VA-µgels is not influenced by the pH indicating that microgels contain fewer amounts of ionizable groups.

Zeta potential measurements have been performed to characterize the influence of pH on the particle charge **(Fig. S1b)**. The appearance of the negative charge over the whole pH range can be explained by the presence of acrylic acid and the negatively charged initiator residues incorporated into the microgel structure during polymerization process. The experimental data for VA-µgel and VAA-µgel are summarized in **Fig. S1**. For AAc containing sample a gradual decrease of zeta potential with increase of pH was observed because more acid groups are getting deprotonated.

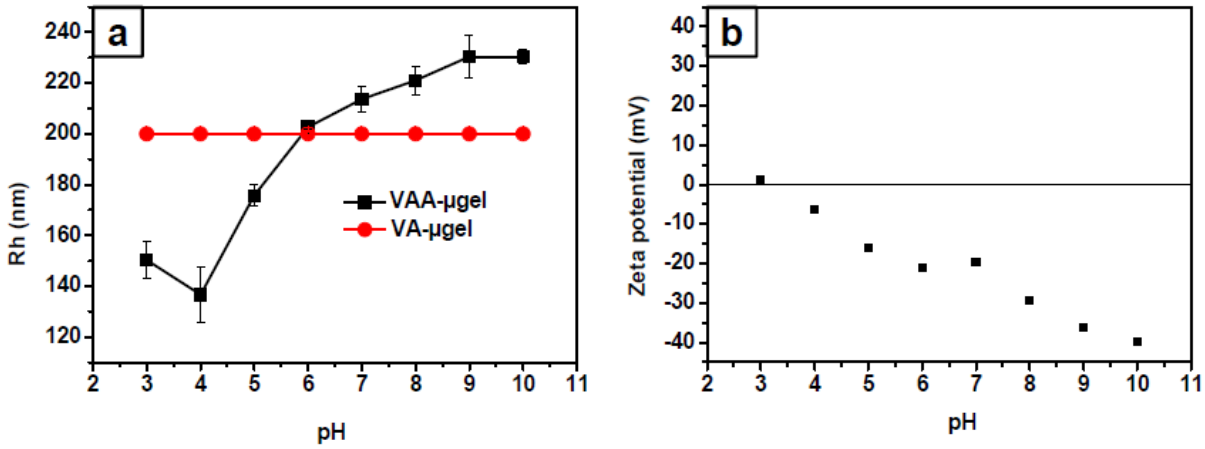

Figure S1. Variation of hydrodynamic radii (a) and surface charge of VAA-µgels (b) as a function of pH.

S2

Potentiometric titration

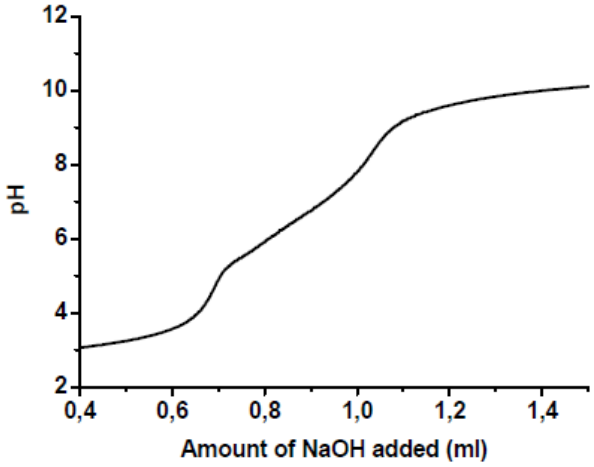

Figure S2. Potentiometric titration of VAA-μgel.

Microgel/gold Composite Particles

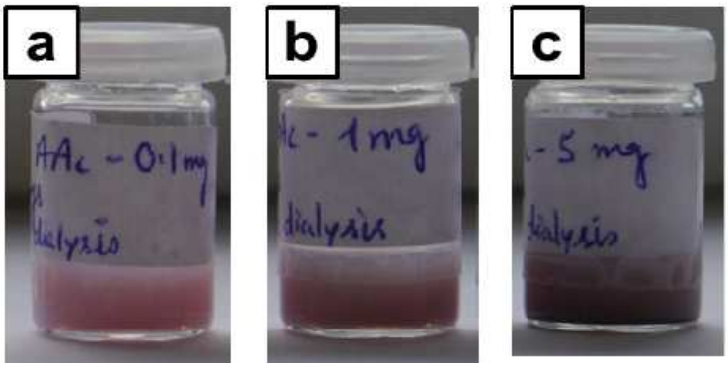

Figure S3. Reduction of $HAuCl_4$ by VAA-0.01 (a), VAA-0.1 (b) and VAA-0.5 (c) observed by color change.

S4

XPS analysis

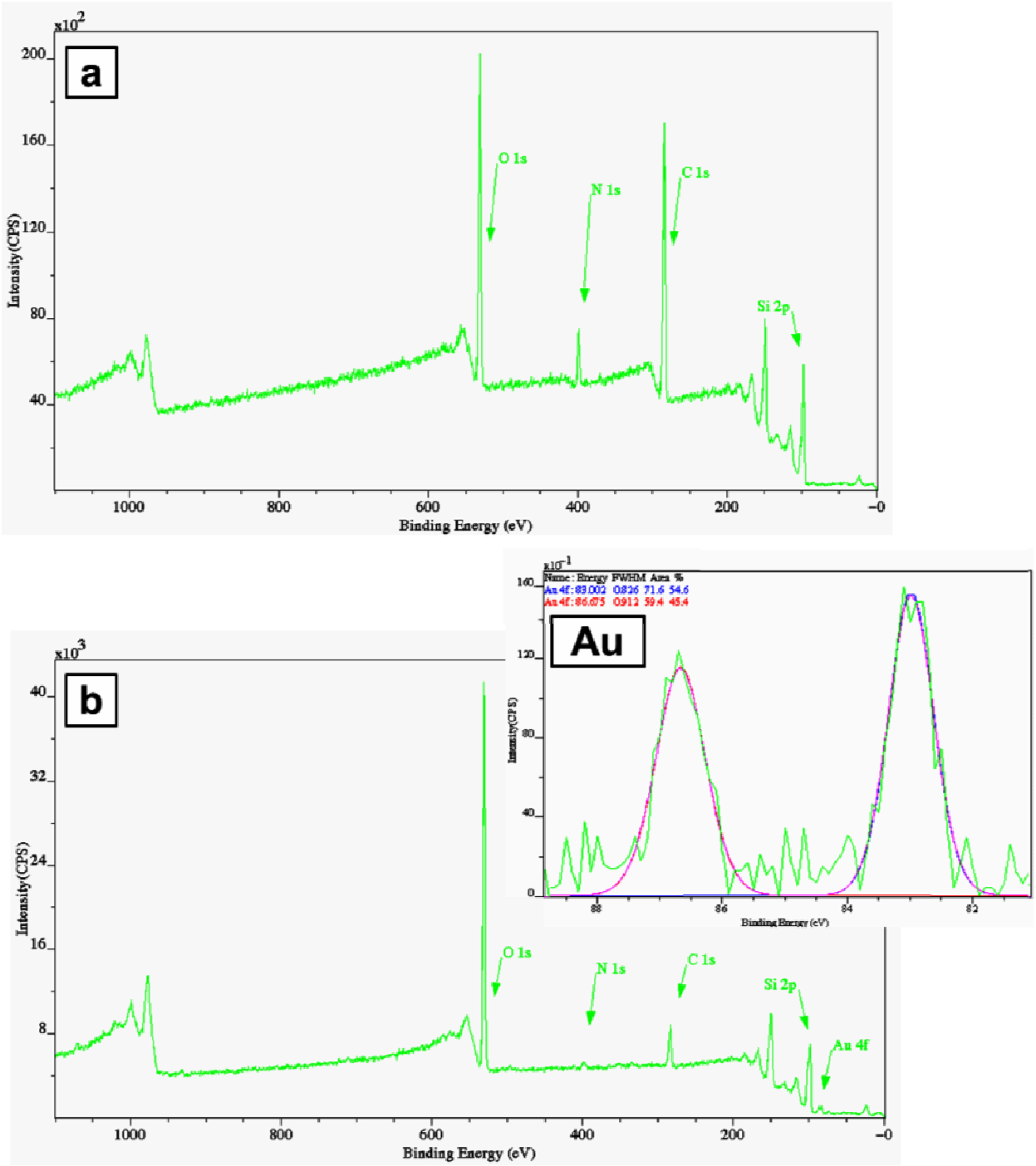

Figure S4 . XPS spectra of VAA-µgel-0.5 before plasma treatment (BP) (a) and after plasma treatment (AP) (b).

UV-Vis analysis of gold-core formation

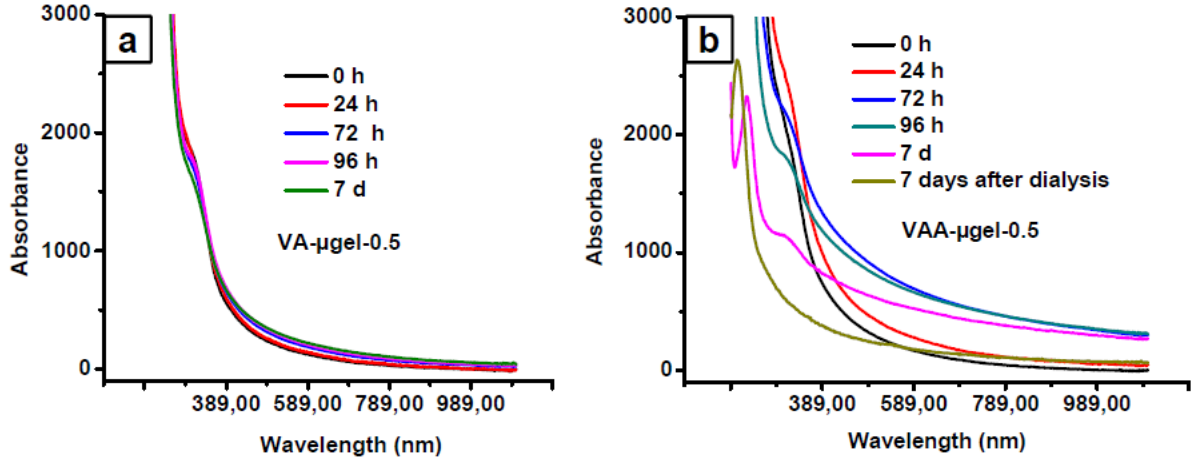

Figure S5. UV-VIS spectra to check the progress of gold formation in VA-µgel-0.5 (a) and VAA-µgel-0.5 (b) as a function of time.