

Supplementary materials

**Table S1:** Independent variables and coded level for CCD

| Symbol | Independent variables                     | Level of coded variables |        |      |
|--------|-------------------------------------------|--------------------------|--------|------|
|        |                                           | Low                      | Middle | High |
| A      | Concentration of PBS (M)                  | 0.001                    | 0.005  | 0.01 |
| B      | Concentration of TABA (nM)                | 50                       | 125    | 200  |
| C      | Incubation period of TABA-Cit-AuNPs (hrs) | 3                        | 13.5   | 24   |
| D      | Concentration of MgSO <sub>4</sub> (mM)   | 1                        | 150.5  | 300  |

**Table S2:** Optimal sensor parameter and method validation for detection of Ac from numerical optimisation.

| Factor | Parameter                                 | Optimised |
|--------|-------------------------------------------|-----------|
| A      | Concentration of PBS (M)                  | 0.01      |
| B      | Concentration of TABA (nM)                | 200       |
| C      | Incubation period of TABA-Cit-AuNPs (hrs) | 3         |
| D      | Concentration of MgSO <sub>4</sub> (mM)   | 1         |

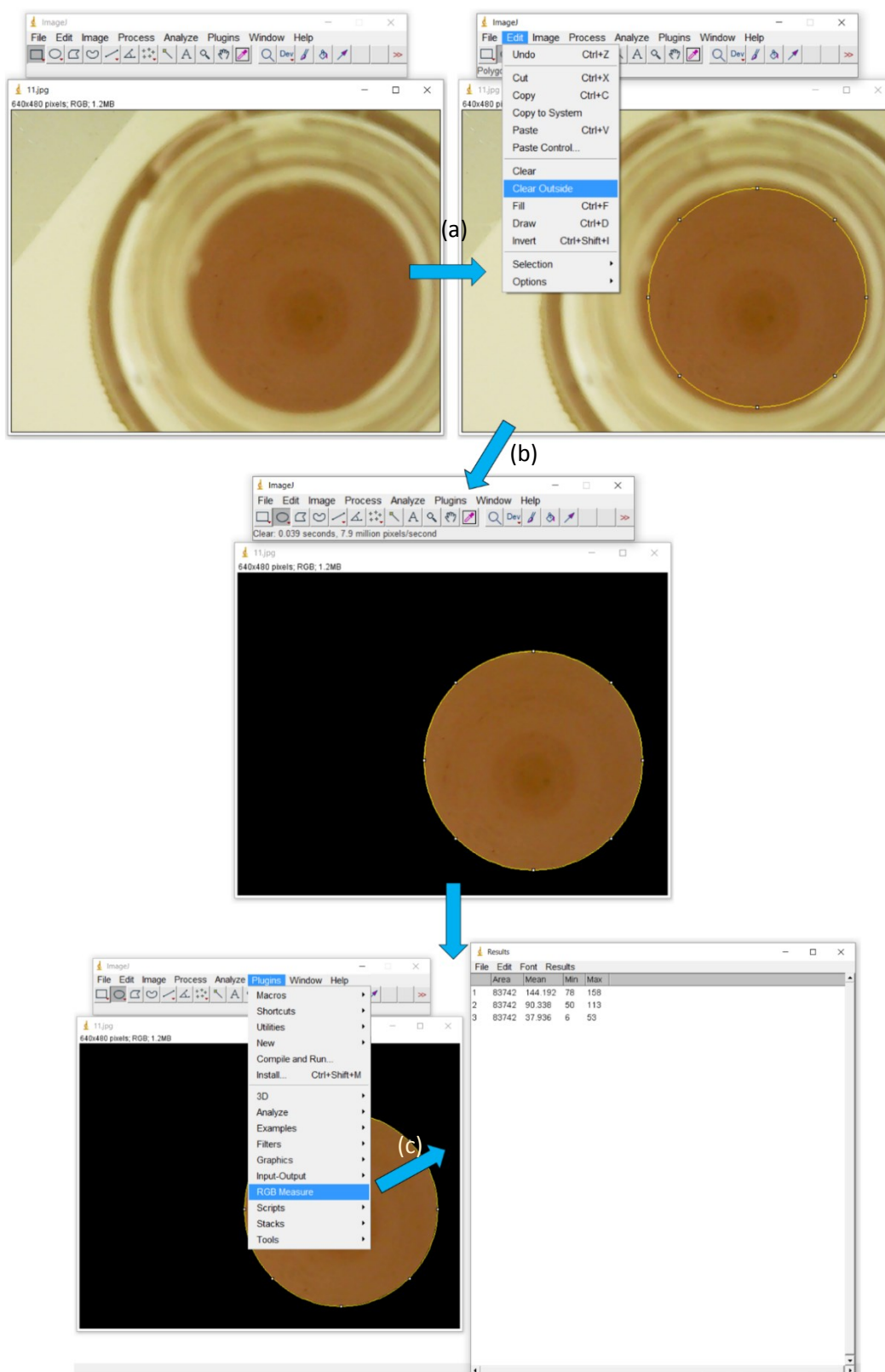


Figure S1: Image processing of captured color image using ImageJ software consists of (a) cropping image, (b) clearing undesirable region, (c) extracting RGB values.