Electronic Supplementary Information for

Achieving enhanced peroxidase-like activity in multimetallic nanorattles

Flavia G. da Silva,[a] Eric V. Formo,[b] and Pedro H. C. Camargo[a,*]

[a] *University of Helsinki, Department of Chemistry, A.I. Virtasen aukio 1, Helsinki, Finland*

[b]*University of Georgia, Georgia Electron Microscopy, Athens, Georgia 30602, United States*

**Corresponding author.* Email: pedro.camargo@helsinki.fi

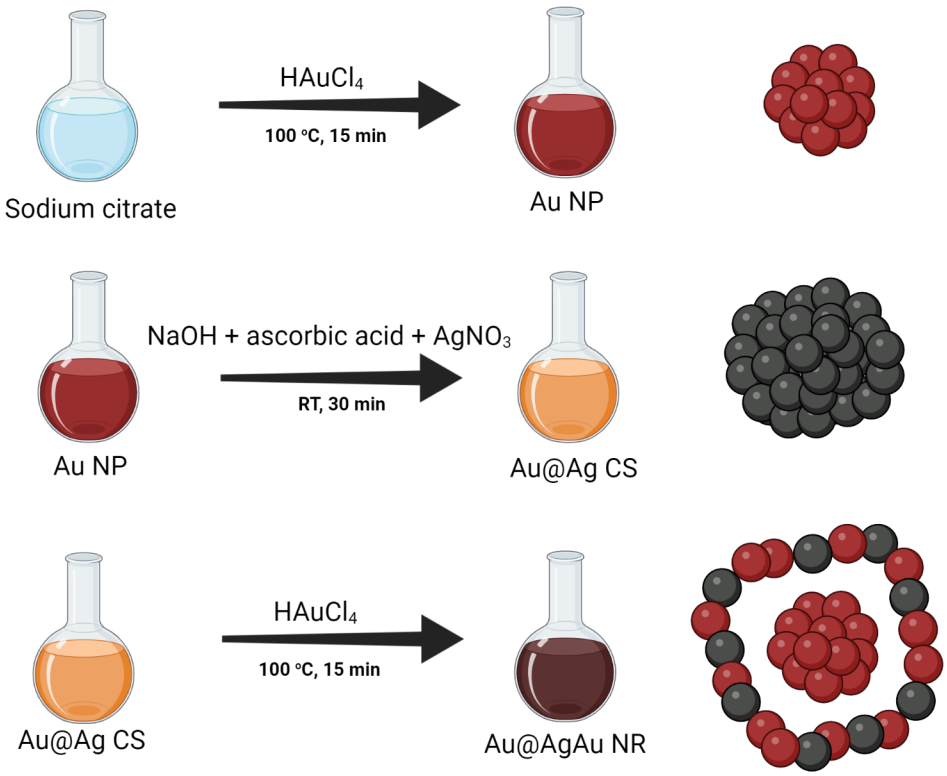

Figure S1. Scheme for the synthesis of Au NPs, Au@Ag core-shell (CS) NPs, and Au@AgAu nanorattles (NRs).

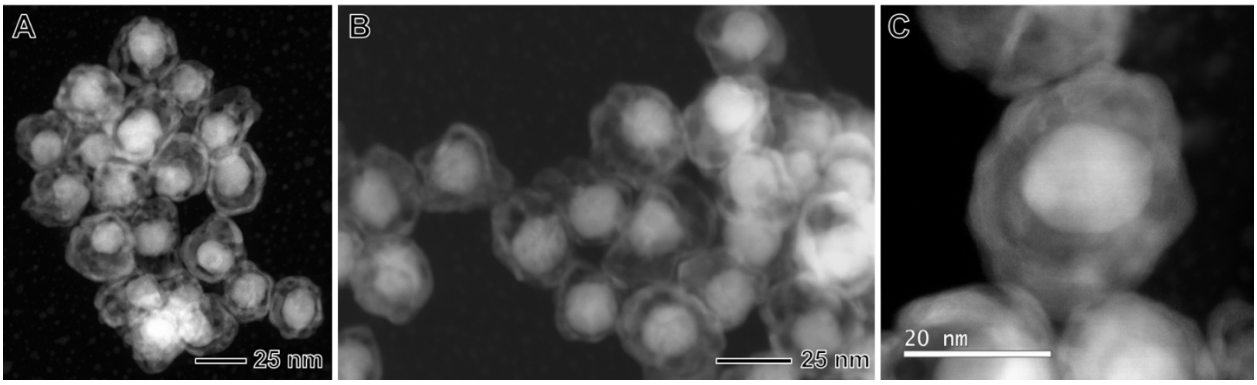

Figure S2. Additional STEM-HAADF images for the Au@AgAu NRs.

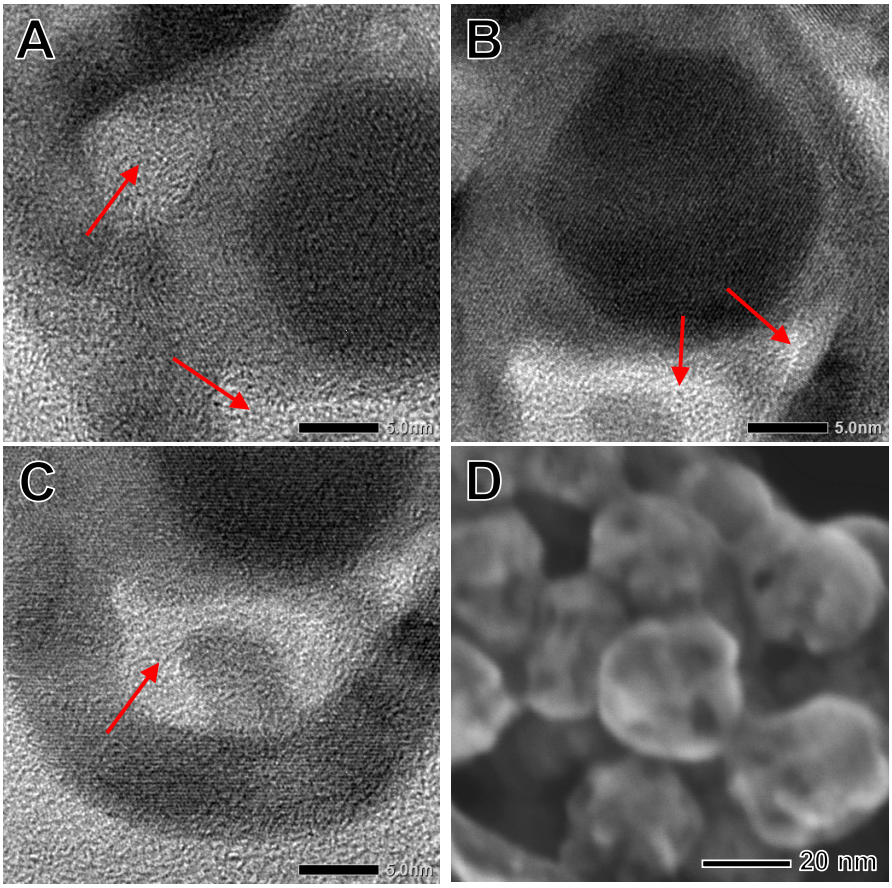

Figure S3. HRTEM images of individual NRs depicting the presence of various pores at the nanorattle shell's surface (A-C, red arrows). (D) Low kV STEM image of the NRs imaged with the secondary electron detector. The pores at the shell's surface appear as dark regions at the NRs surface.

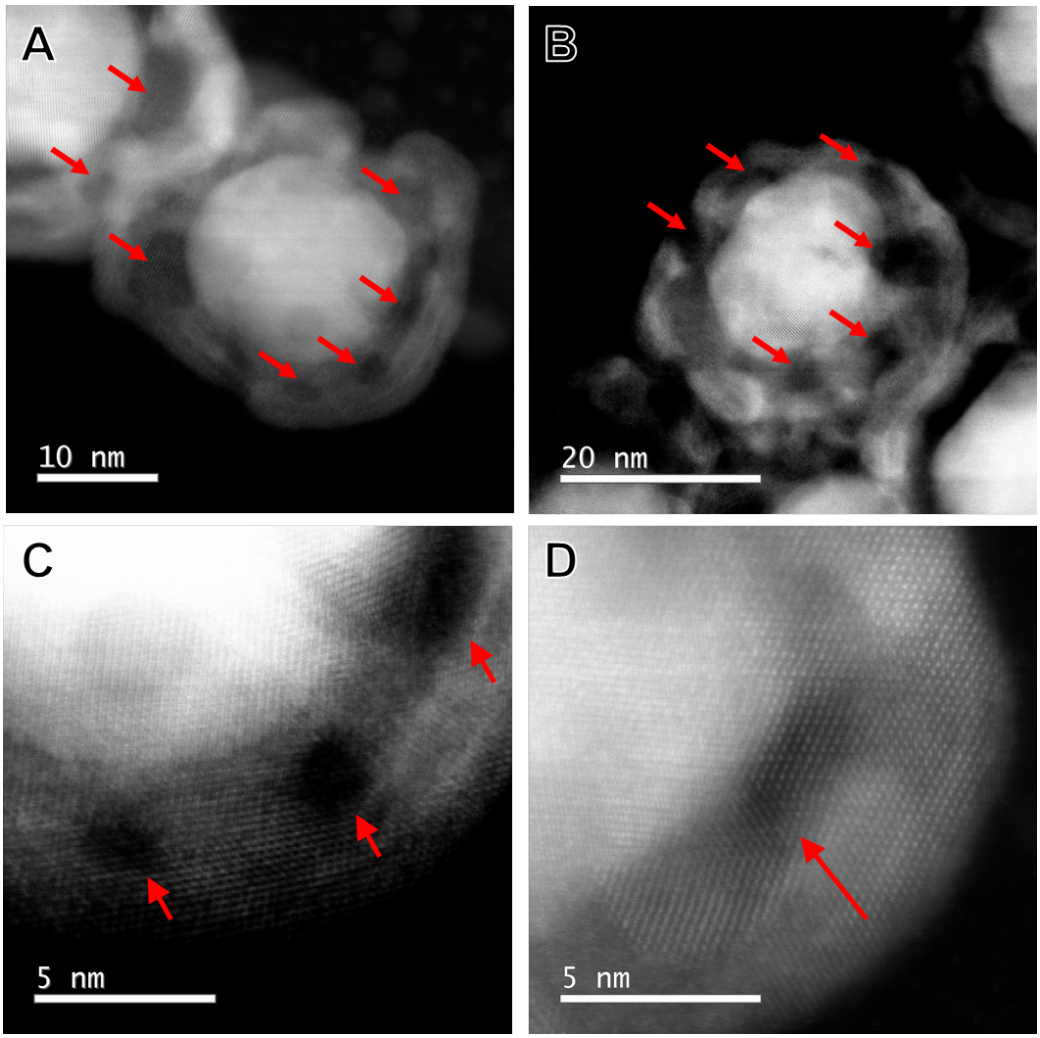

Figure S4. (A-D) STEM-HAADF images of individual NRs depicting the presence of various pores at the nanorattle shell's surface (A-D, red arrows). They are < 10 nm in diameter.

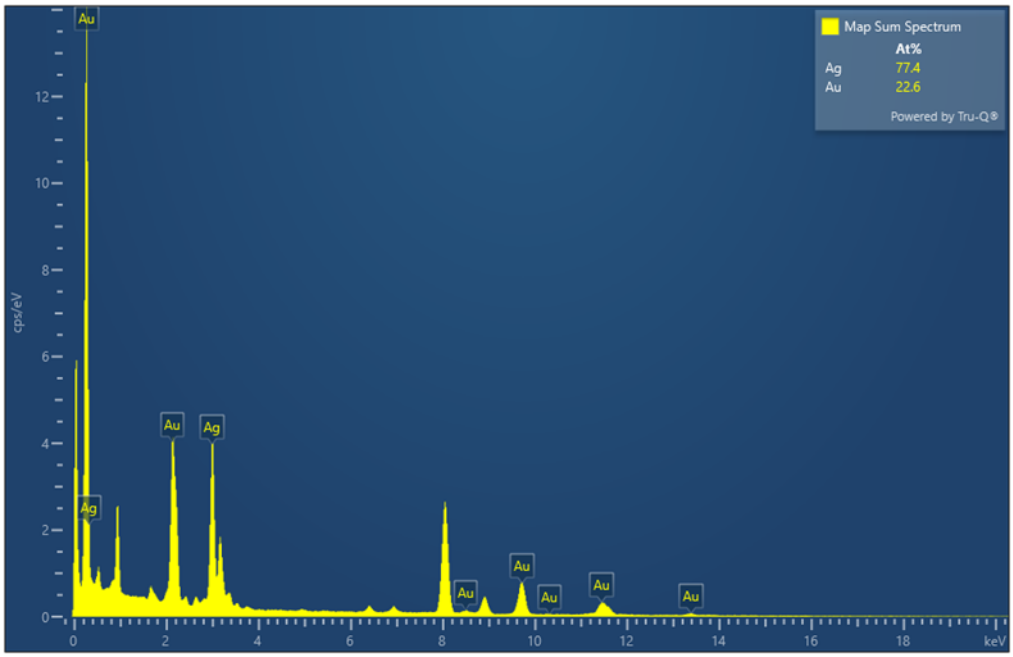

Figure S5. STEM-EDS spectrum for the Au@AgAu NRs registered from the region shown in Figure 2D-F.

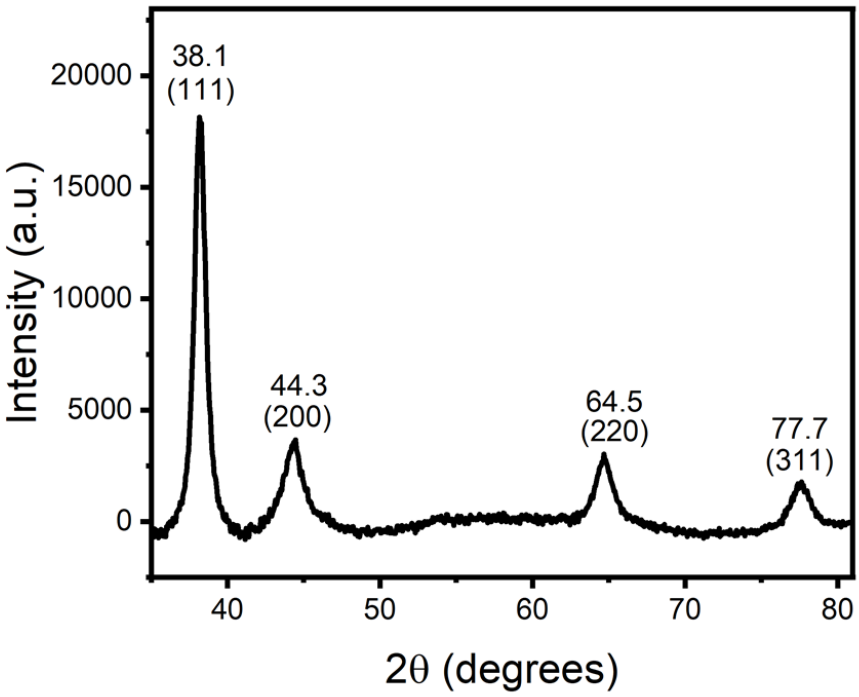

Figure S6. XRD pattern for Au@AgAu NRs. The detected diffraction peaks are assigned to *fcc* Au and Ag.

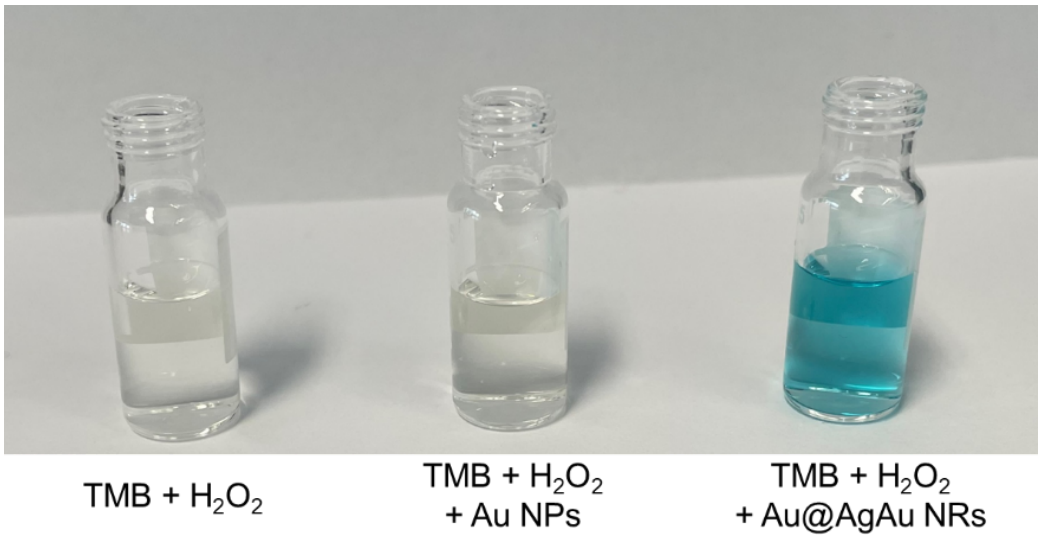

Figure S7. Photographs showing the colour changes of the reaction mixture in the (A) absence of NRs (control containing only TMB and H_2O_2), (B) in the presence of Au NPs (no noticeable changes in colour), and (C) in the presence of the Au@AgAu NRs. Here, the formation of oxTMB can be visualized by the appearance of a blue colour relative to the initial solution (A).

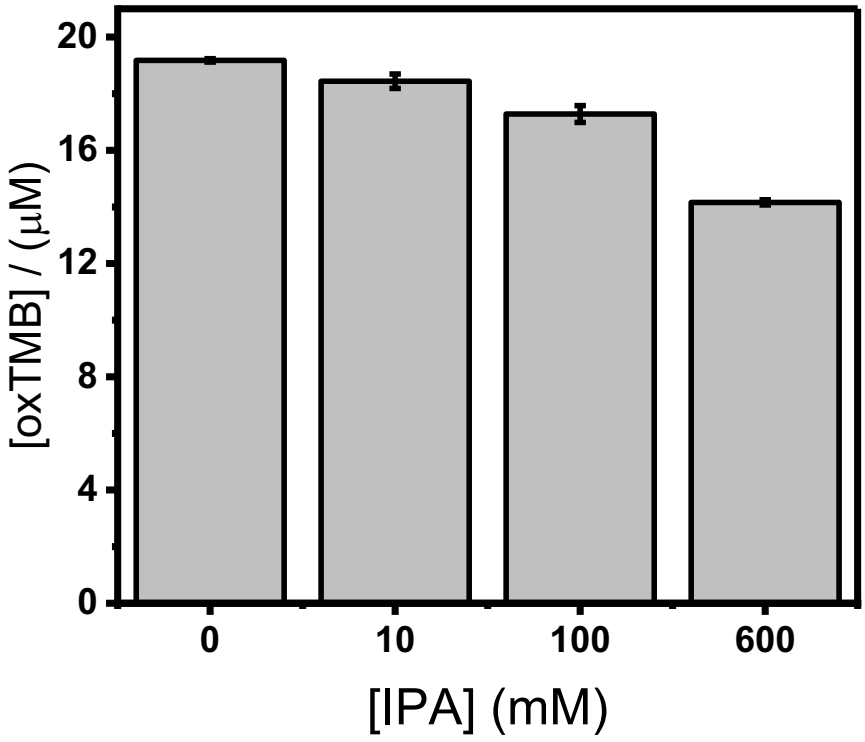

Figure S8. Comparison on the NRs peroxidise-like activity expressed by the concentration of oxTMB produced in the presence of different concentrations of IPA as a hydroxyl radical scavenger IPA (0-600 mM). All reaction conditions were kept constant. The error bars represent the standard deviation of the three independent measurements. The decrease in the [oxTMB] with the increase in [IPA] agrees with the presence of hydroxyl radicals in the reaction mixture.