Supporting Information for

Development of Ag/Cerium Iron Oxide Nanostructures Electrode Material: An Efficient Electrochemical Detection of tert-butylhydroquinone in Food Products

S1. Morphological Analysis and Particle Size Distribution of $Ag/CeFeO_3$ Nanostructures (ACFO)

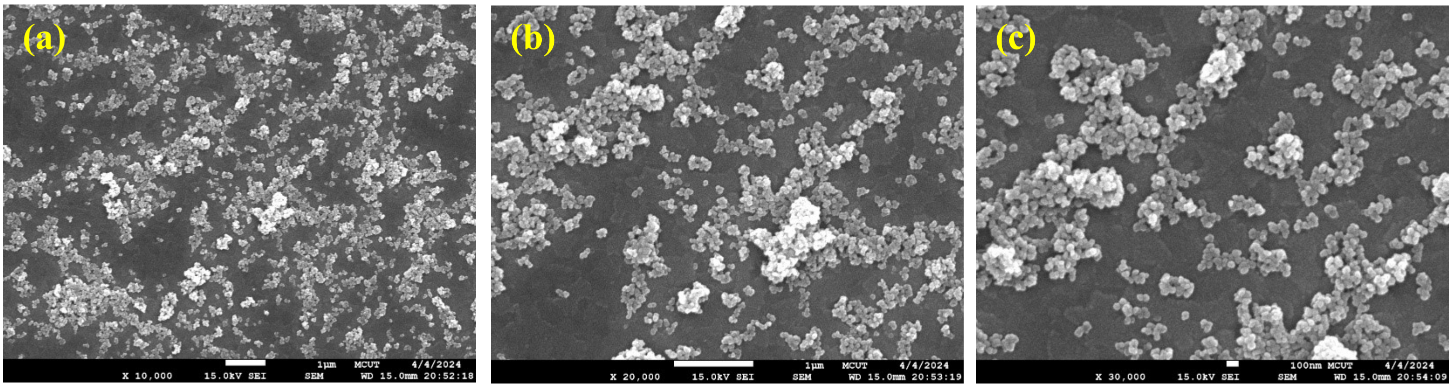

Fig. S1. Different magnifications of SEM images of ACFO Ci@GCE (citric acid) are shown in (a) 1 µm, (b) 1 µm, and (c) 100 nm

$Ag/CeFeO_3$ synthesized using different surfactants such as ACFO Ci@GCE (citric acid), ACFO Ur@GCE (urea), ACFO SDS@GCE (SDS), and ACFO CTAB@GCE (CTAB) were analyzed for particle size distribution using SEM images, and histograms were plotted based on measured particle sizes. For all samples except ACFO CTAB@GCE (CTAB), size distribution analysis was performed using 30 particles, while ACFO CTAB@GCE (CTAB) was analyzed using 15 particles due to sample limitations. The average practical particle size was found to be 49.57 nm for ACFO Ci@GCE (citric acid), 55.28 nm for ACFO Ur@GCE (urea), 79.08 nm for ACFO SDS@GCE (SDS), and significantly larger at 500.04 nm for ACFO CTAB@GCE (CTAB). The notably large particle size in the ACFO CTAB@GCE sample suggests that CTAB is less effective in controlling particle growth during synthesis, possibly due to its micelle formation behaviour or steric hindrance effects, which promote particle agglomeration. In contrast, citric acid, urea, and SDS provide better control over nucleation and growth, yielding smaller, more uniform particles that contribute to a higher electrochemically active surface area and improved electrochemical performance.

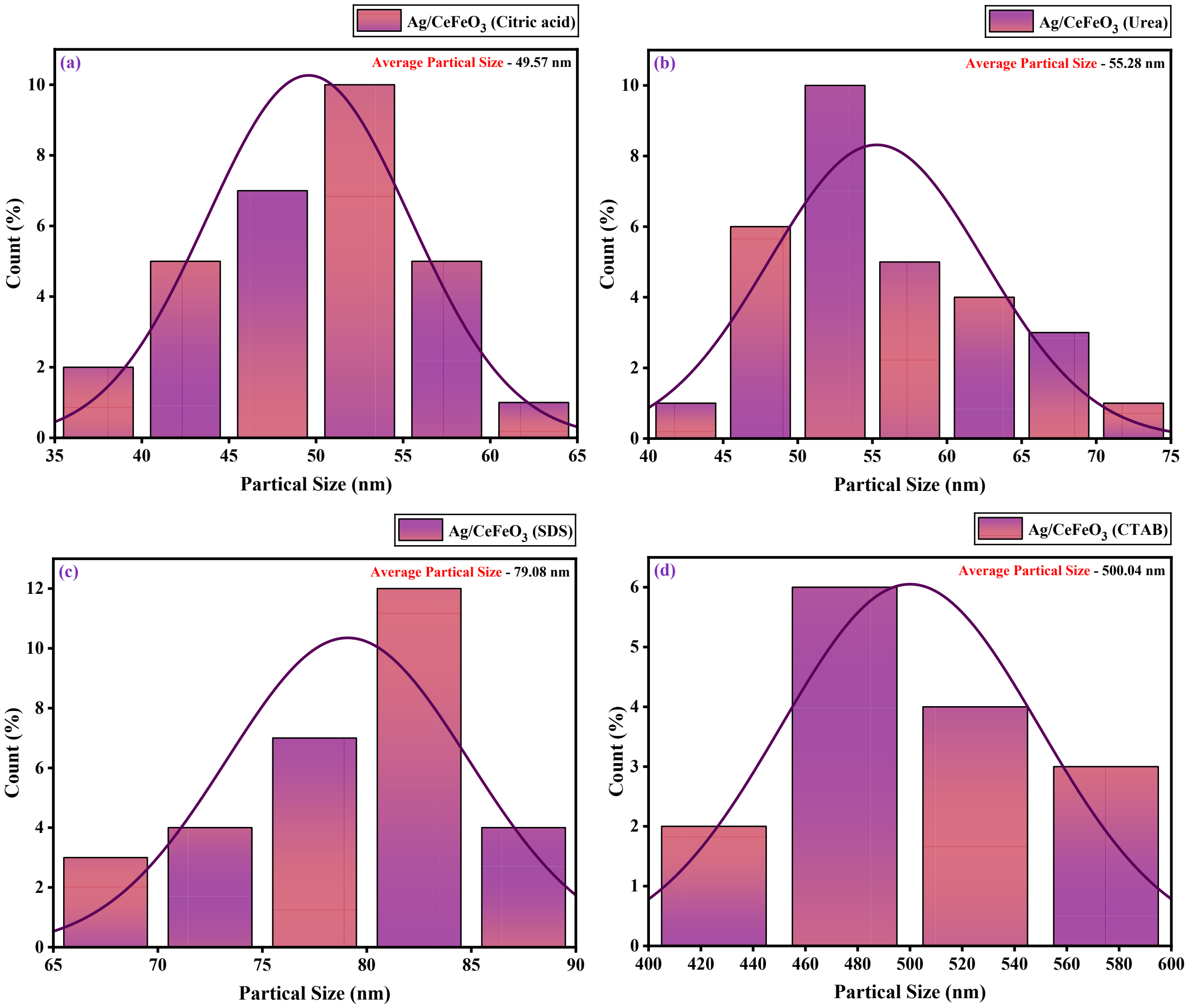

Fig. S2. Average Particle Size of nanostructure using different surfactant **(a)** Ag/CeFeO_3 nanostructure using Citric acid **(b)** Ag/CeFeO_3 nanostructure using Urea **(c)** Ag/CeFeO_3 nanostructure using SDS **(d)** Ag/CeFeO_3 nanostructure using CTAB.