Electronic Supplementary Information

Porous trimetallic Au@Pd@Ru nanoparticle system: Synthesis, characterisation and efficient dye degradation and removal

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Scheme S1. Chemical structure of dyes and their *in-situ* generated amines by trimetallic Au@Pd@Ru nanocatalyst in this work.

Fig. S1 FE-SEM (a, b) and TEM images (c, d) of porous AuNPs and porous Au@PdNPs,

respectively, and their EDS spectra (e) and (f). Inset of (e) and (f) represents the region selected for recording the EDS spectra.



Fig. S2 Particle size distribution graphs for the synthesised (a) porous AuNPs, (b) porous

Au@PdNPs and (c) porous Au@Pd@RuNPs.



Fig. S3 UV-Vis spectra of (a) congo red, (b) reactive red-120 and (c) reactive black-5 dyes before (i) and after (ii) catalytic decomposition using porous Au@Pd@RuNPs and (iii) 12 h

after dolochar (400 mg) treatment and (iv) blank in tris buffer (pH 9.0). [dye] = 0.1 mM; [NaBH₄] = 100 mM; [Au@Pd@RuNPs] = 0.05 pM; Temperature; 298 K.



Fig. S4 FE-SEM images of dolochar (a) before and (b) after sorption of amines and their (c) and (d) corresponding EDS spectra.



