Electronic Supplementary Material (ESI) for Green Chemistry.

Supporting information of

Direct thermo catalytic transformation of pine wood into low oxygenated bio-fuel

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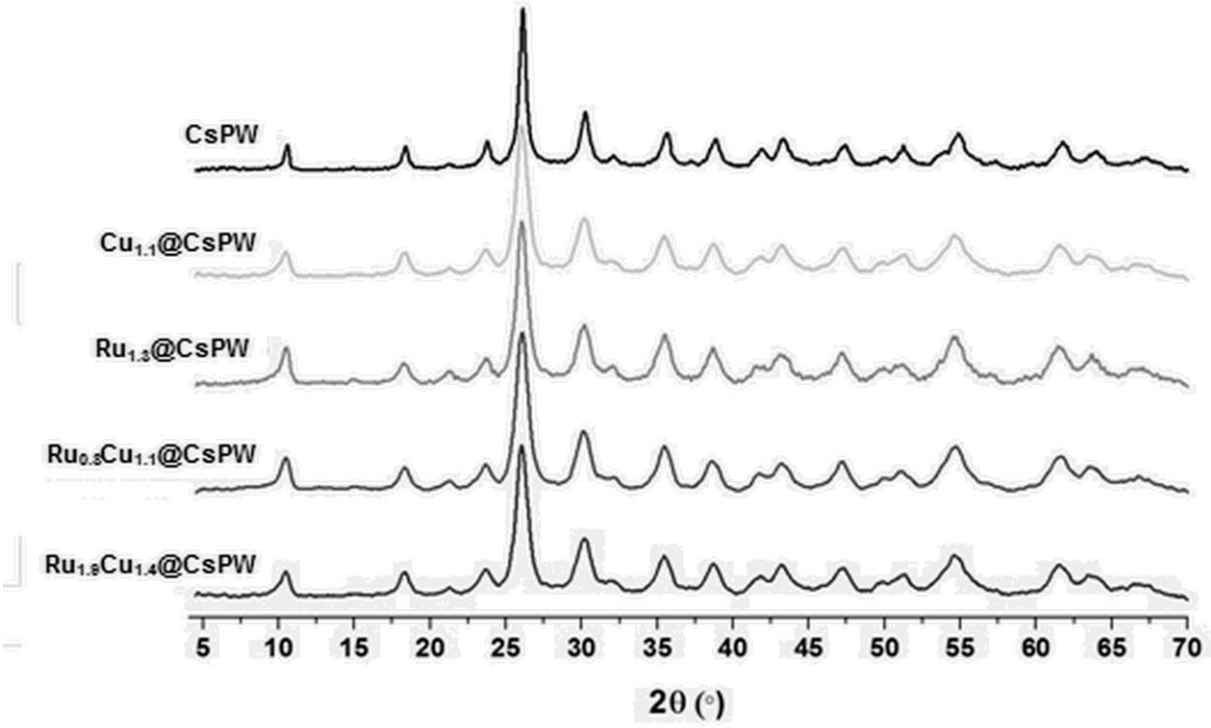

Fig. S1 X-ray diffractgrams of the different samples.

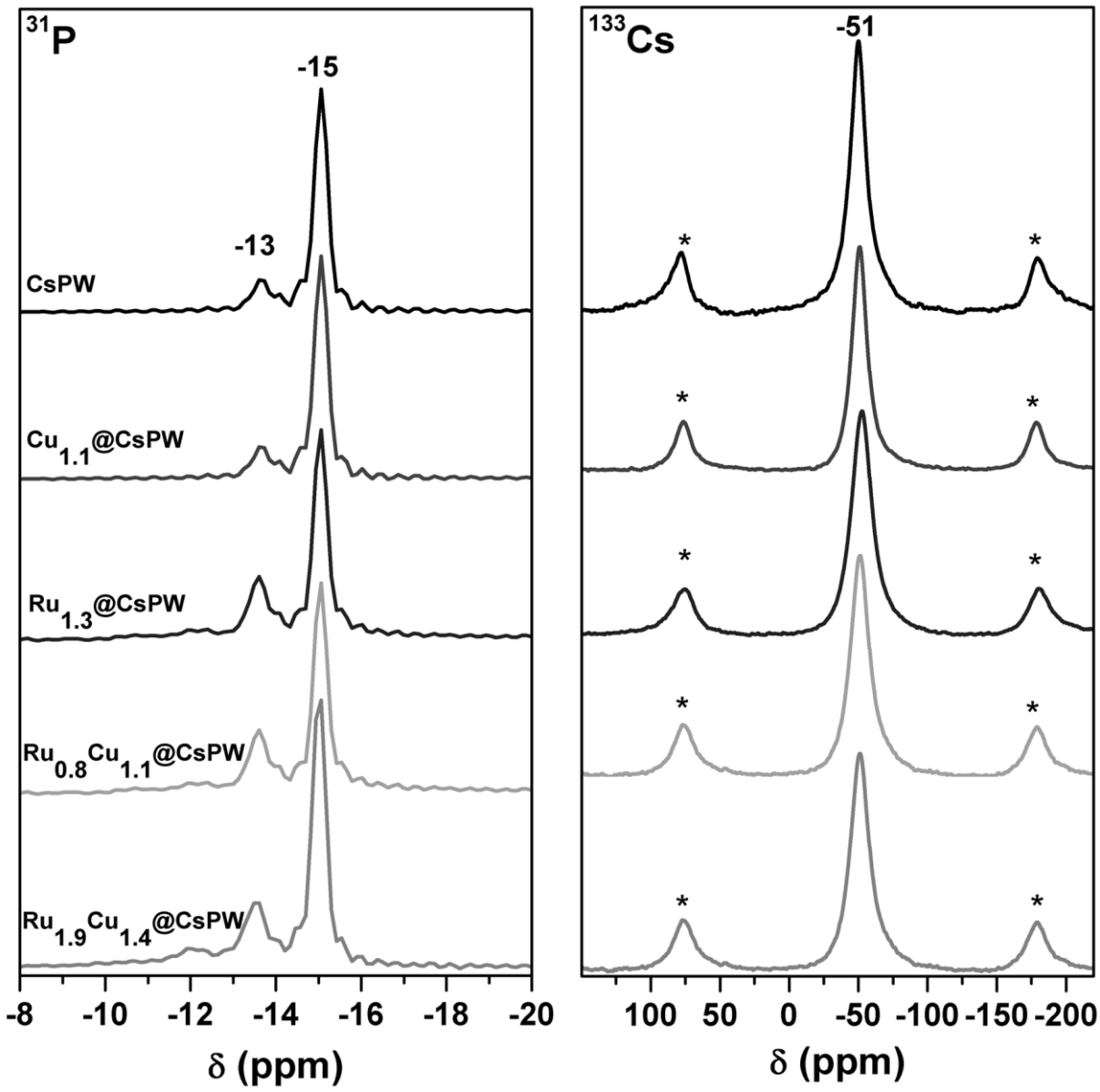

Fig. S2 ^{31}P and ^{133}Cs solid state MAS NMR of the samples after thermal treatment at 350 °C under oxygen and hydrogen.

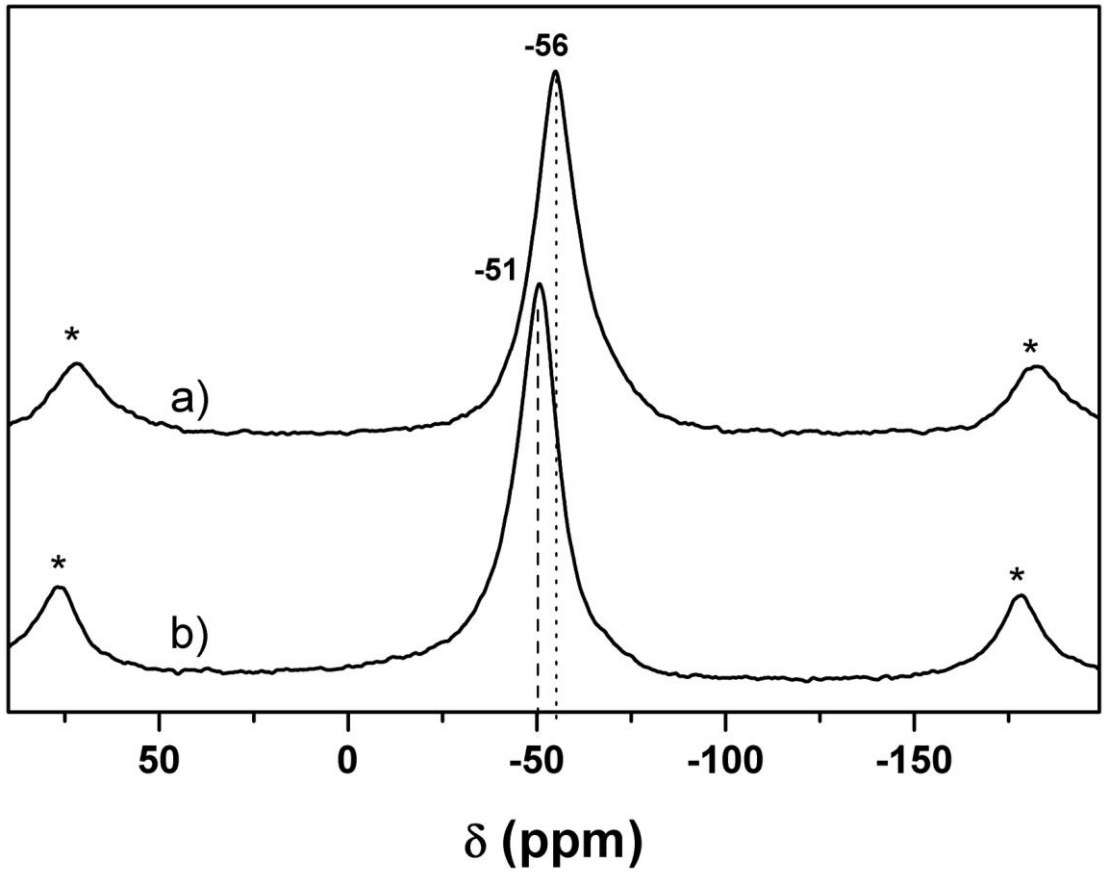

Fig .S3 ^{133}Cs solid state MAS NMR of cesium exchange heteropolyanion support dried at room temperature (a) and dried at 200 °C (b).

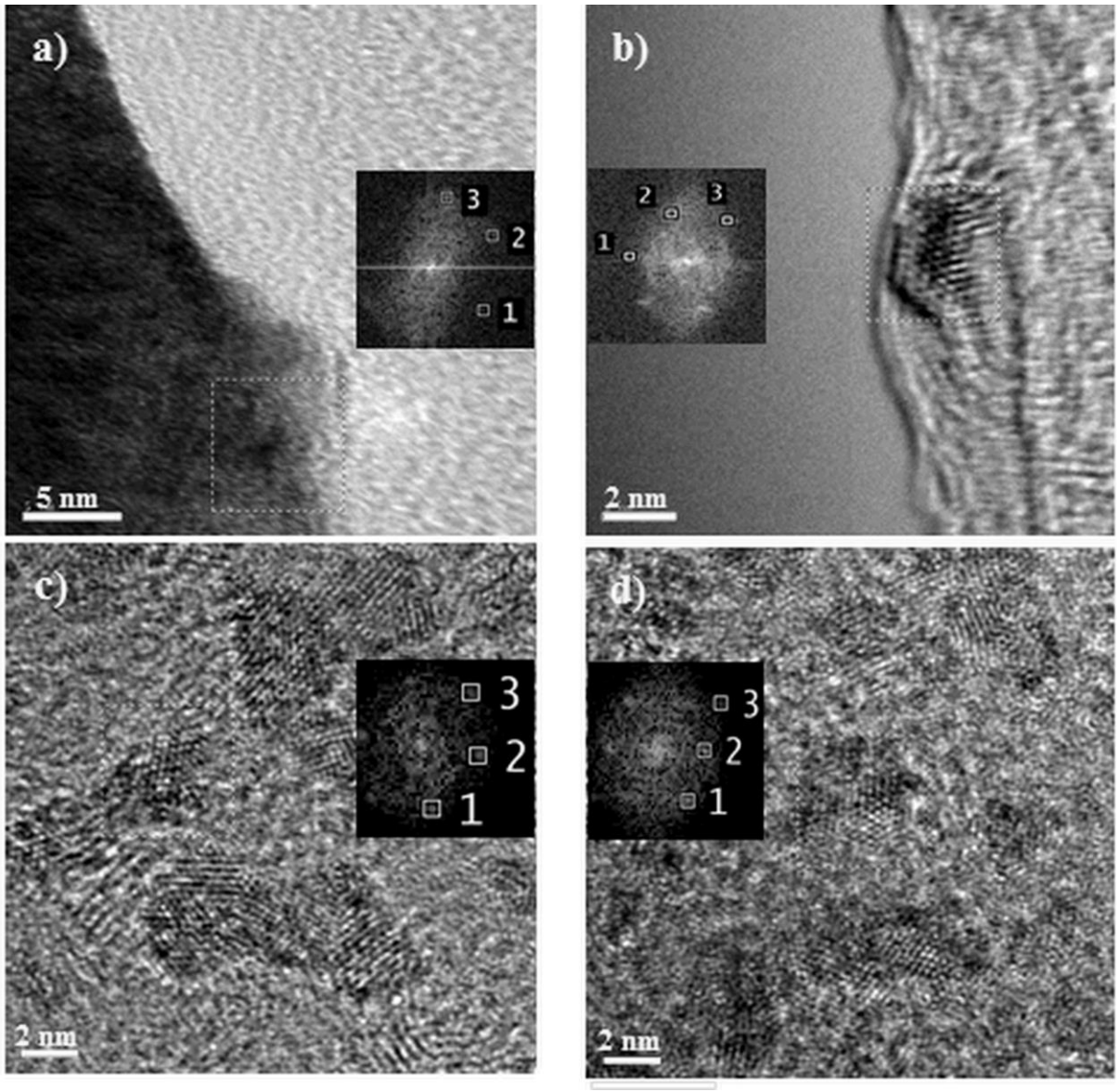

Fig. S4 High resolution transmission electron microscopy images of $Ru_{1.9}Cu_{1.4}$@CsPW catalyst showing the different structures a) hexagonal Ru(0), b) tetragonal RuO_2, c) cubic RuO_4 and d) monoclinic CuO. Inset representative of fast fourier transformation power spectra of the particles.

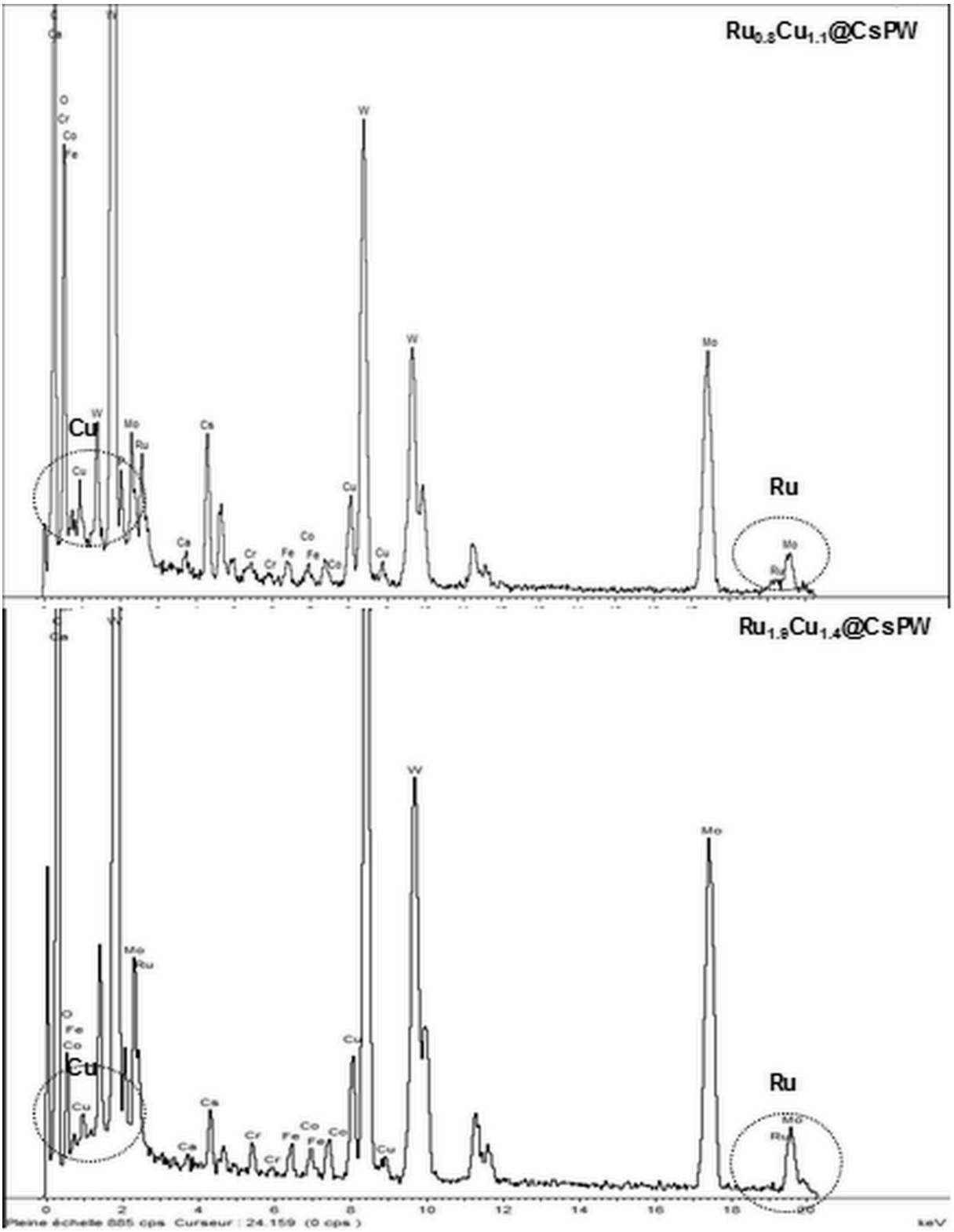

Fig. S5 Energy-dispersive X-ray spectroscopy of two catalysts $Ru_{1.9}Cu_{1.4}$@CsPW and $Ru_{10.8}Cu_{1.1}$@CsPW,showing the presence of copper and ruthenium.

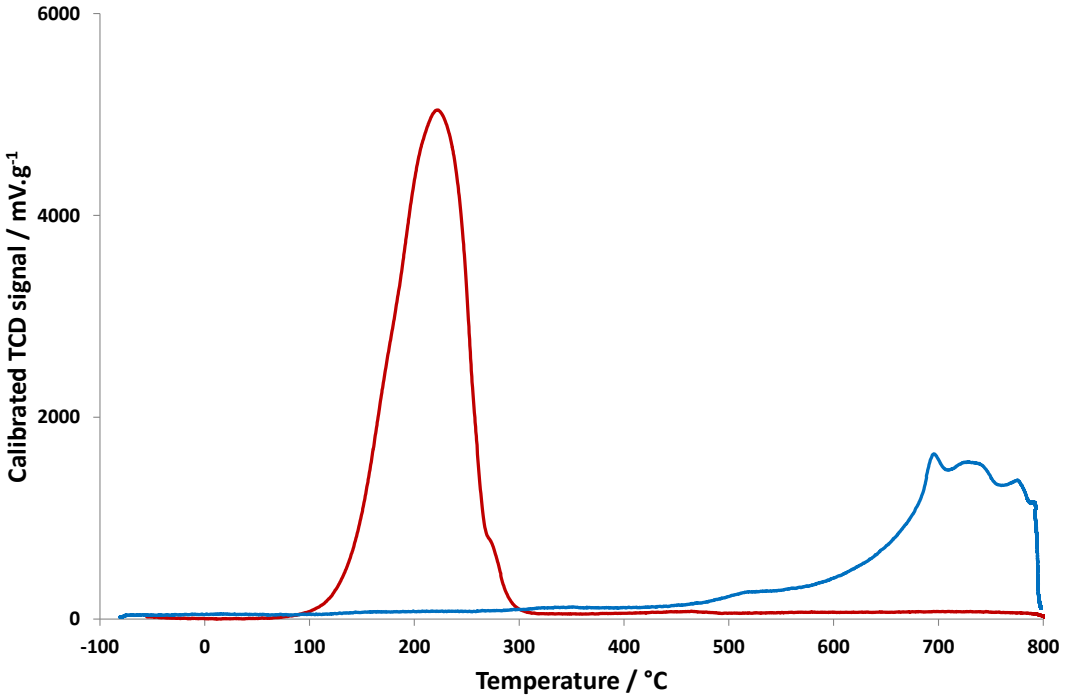

Fig. S6: s-TPR profile of Cu10wt%@Al_2O_3 (red) and Cu1wt%@CsWP (blue) catalysts.

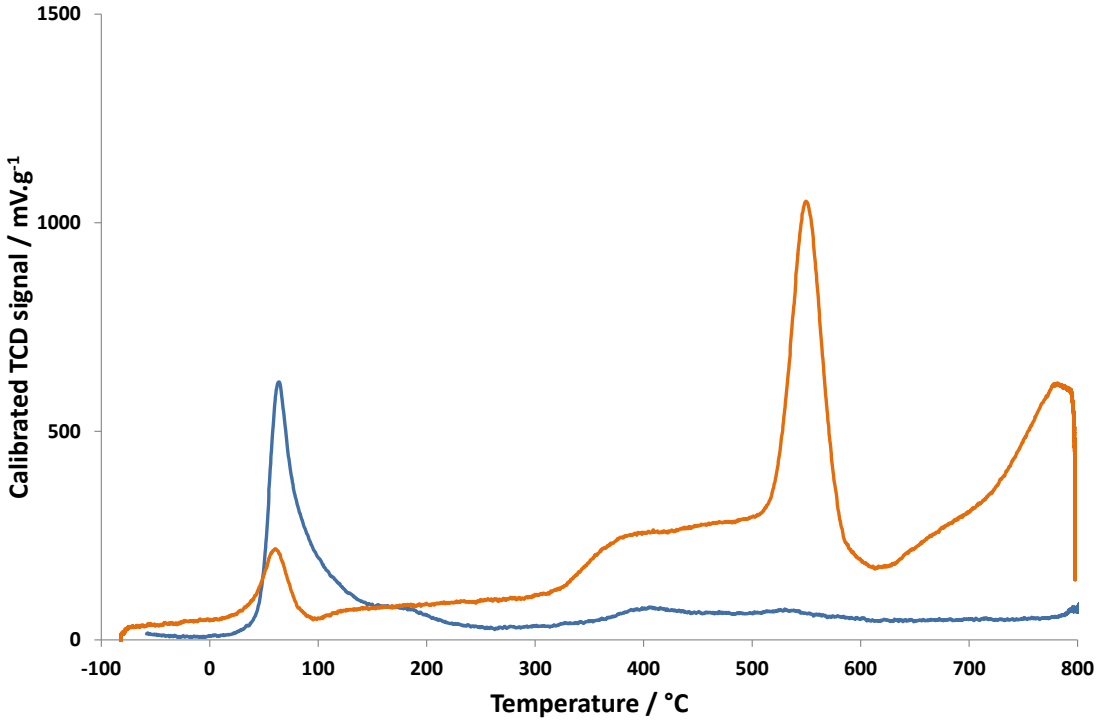

Fig. S7: s-TPR profile of Ru1wt%@CsWP (orange) and Ru2wt%@ Al_2O_3 (blue) catalysts.

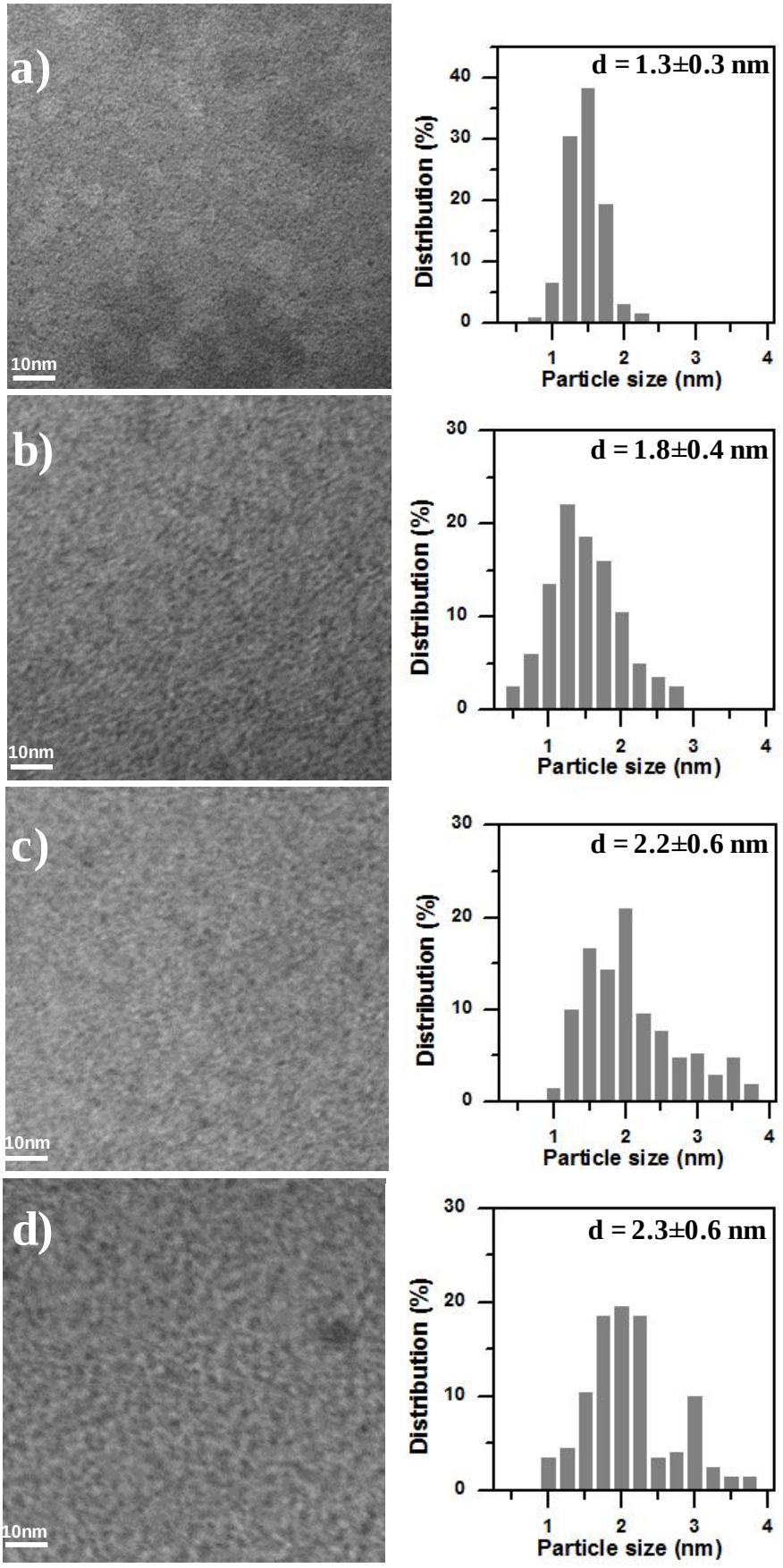

Fig. S8 Transmission electron micfroscopy of a) as prepared $Ru_{1.9}Cu_{1.4}$@CSPW catalyst, b) after the first catalytic cycle, c) after second catalystic cycle and d) after fourth catalytic cycle.