**Supplementary information**

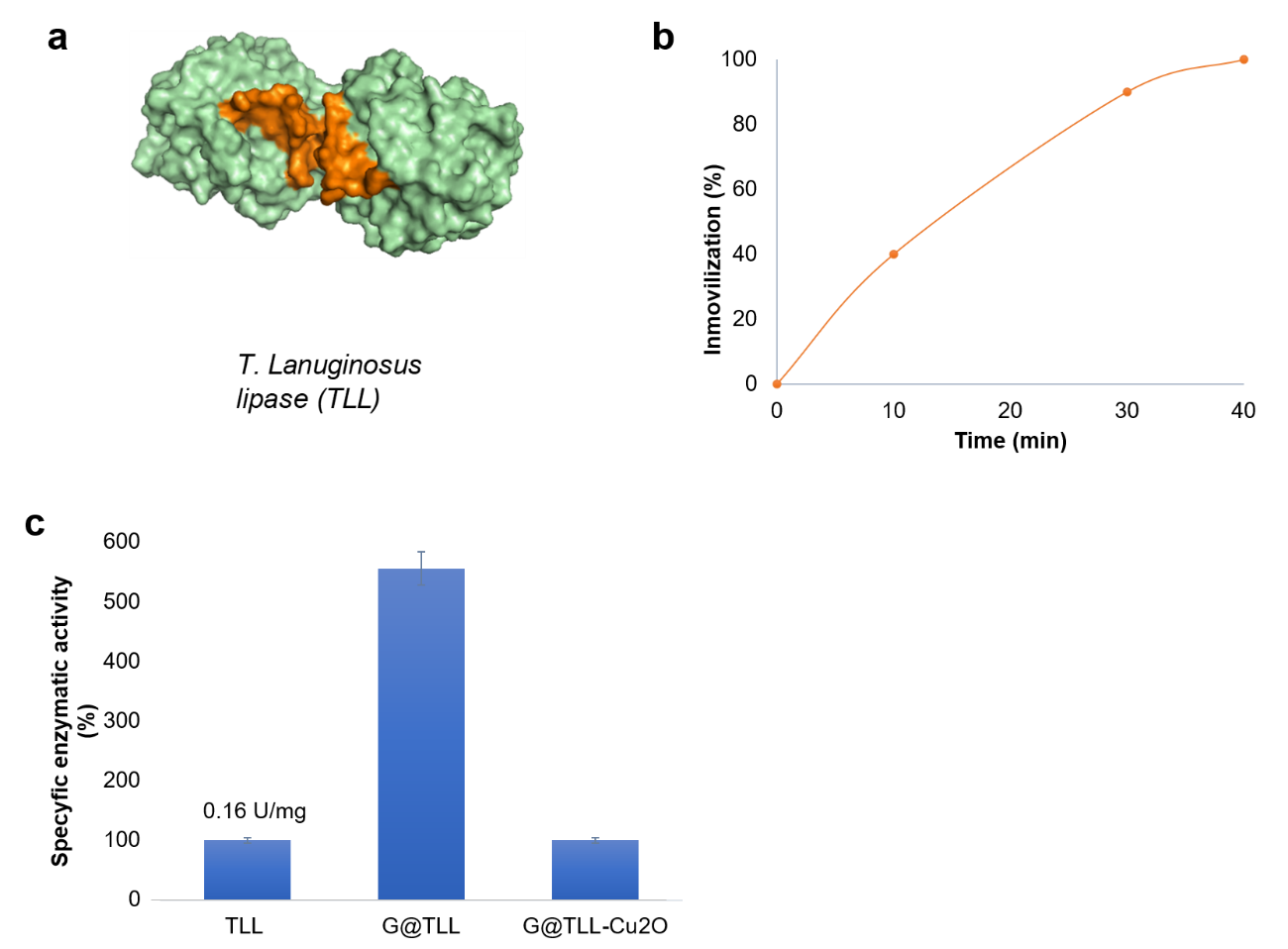
**Graphene-TLL-Cu2ONPs hybrid as Highly Efficient Catalyst for degradation of organic pollutans**

**Noelia Losada-Garciaa,Jannier Carranzaa and Jose M. Palomo\* a**

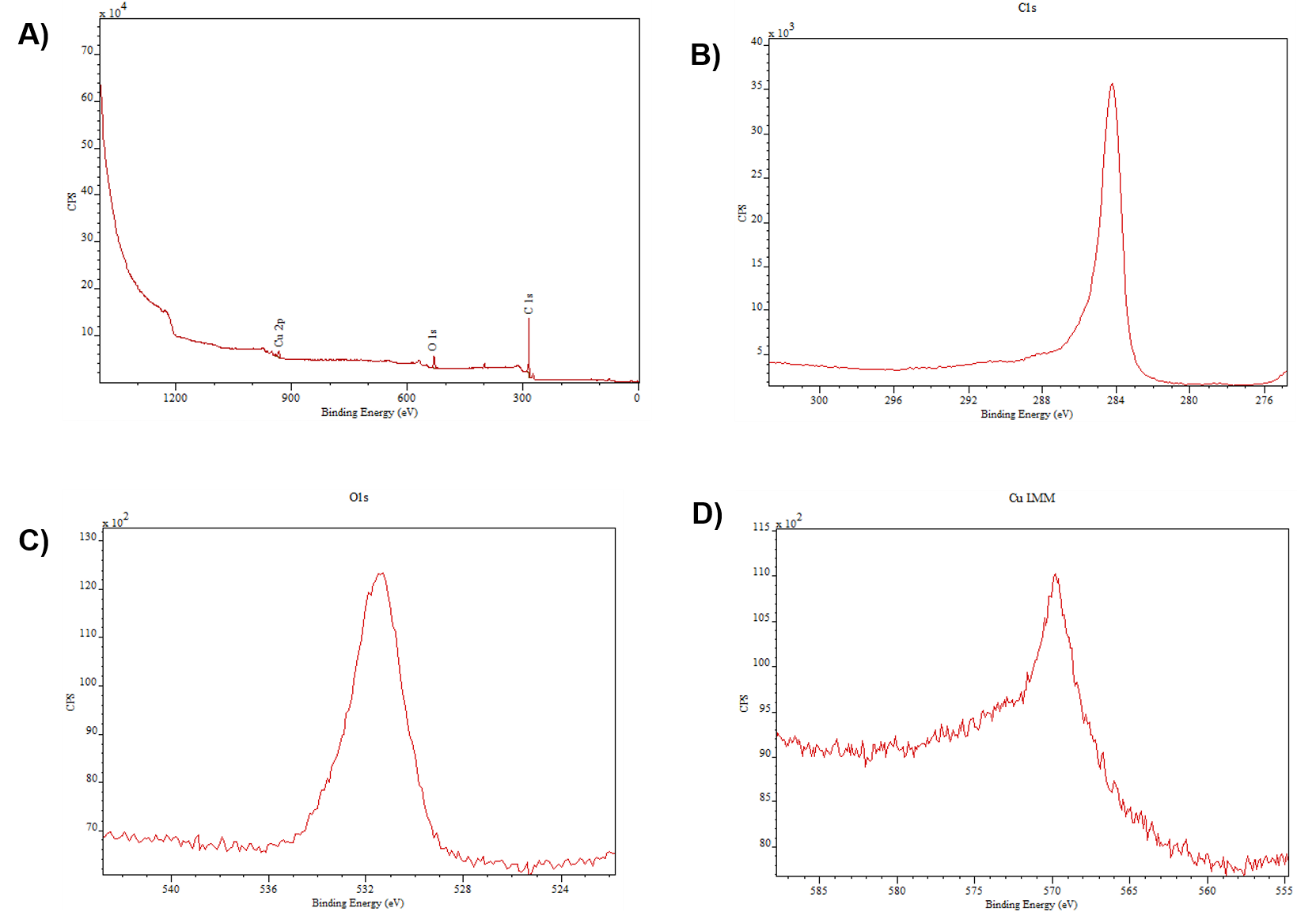
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**Synthesis of TLL-Cu2O hybrid**

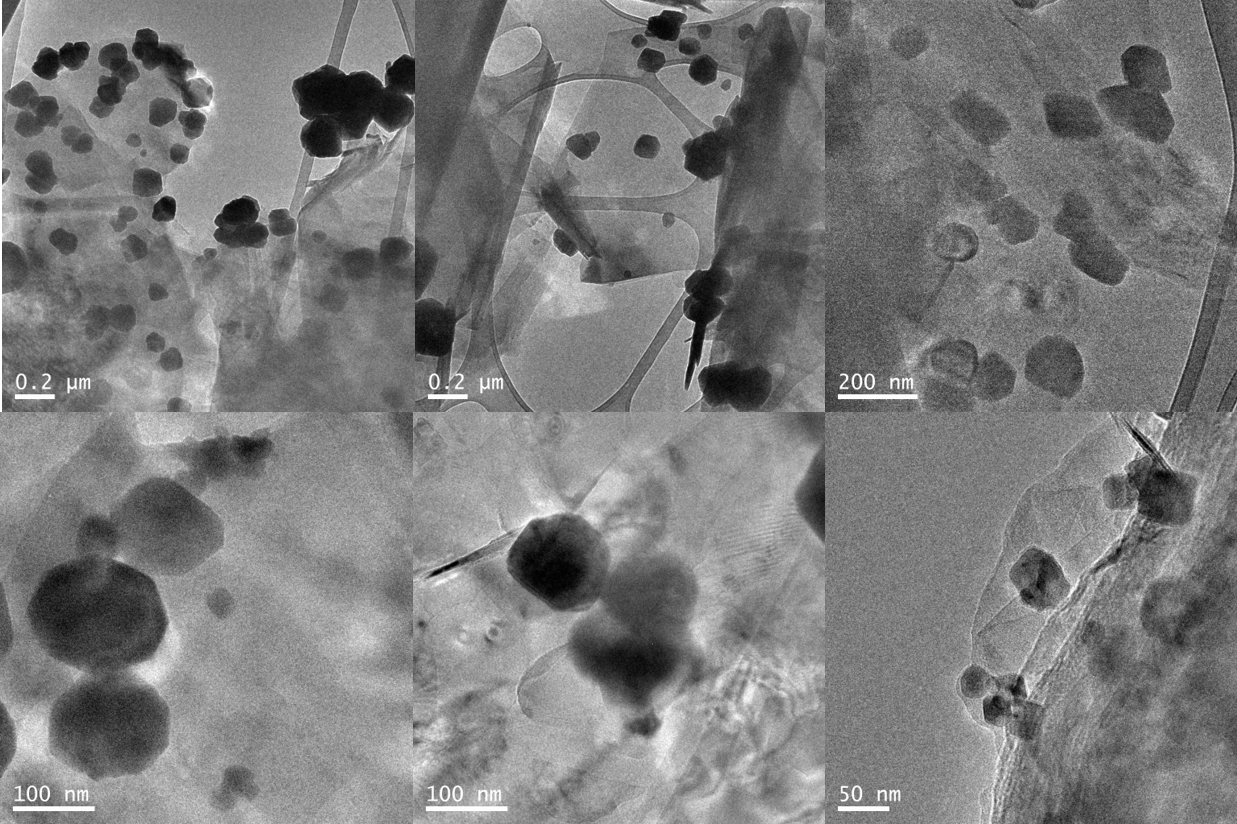
0.9 mL of commercial (18 mg of protein) *Thermomyces lanuginosus* lipase (TLL) solution was added to 60 mL 0.1M of buffer sodium phosphate pH 7 in a 250 mL glass bottle containing a small magnetic bar stirrer. Then, 600 mg of Cu2SO4 x 5H2O (10 mg/ml) was added to the protein solution and it was maintained for 16 hours. After the first 30 min incubation, the solution turned cloudy (turquoise). After 16 h, 6 mL of NaBH4 (300 mg) aqueous solution (1.2 M) was added to the cloudy solution (in two times of 3 mL) obtaining a final concentration of 0.12 M of sodium borohydride in the mixture. The solution turned rapidly black and, the mixture was reduced during 30 min. After the incubation, the mixture was centrifuged at 8000 rpm for 5 min, (10 mL per falcon type tube). The generated pellet was re-suspended in 15 mL of water. It was centrifuged again at 8000 r.p.m for 5 min and the supernatant removed. The process was repeated twice more. Finally, the supernatant was removed and the pellet of each falcon was re-suspended in 2 mL of water, collected all solutions in a round-bottom flask, frozen with liquid nitrogen and lyophilized for 16 hours. After that, 150 mg of the so called **TLL-Cu2O hybrid** was obtained.

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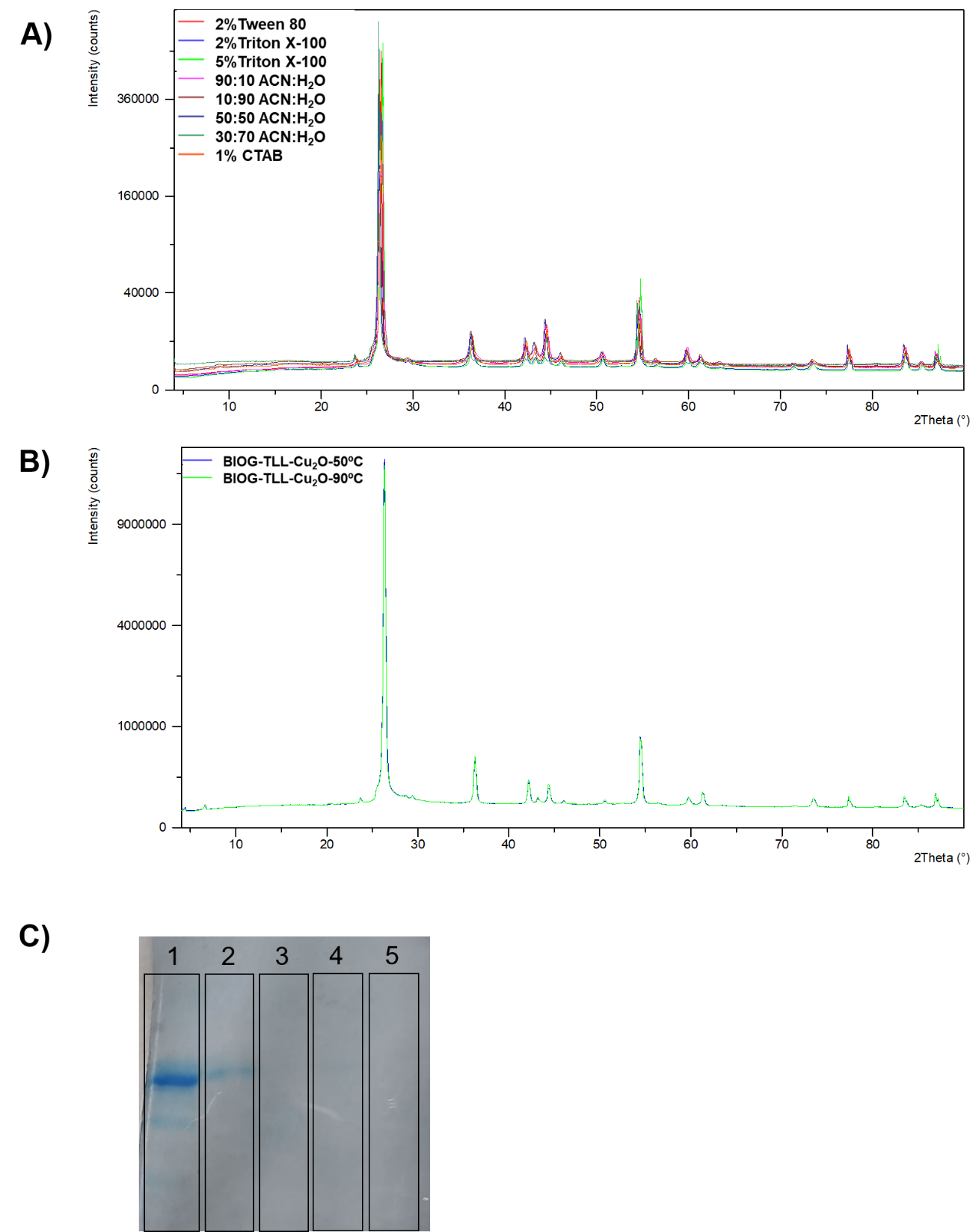
**Figure S1. A)** Three-dimensional Surface of dimer from TLL; **B)** Immobilization curve of G@TLL; **C)** Enzymatic activity.

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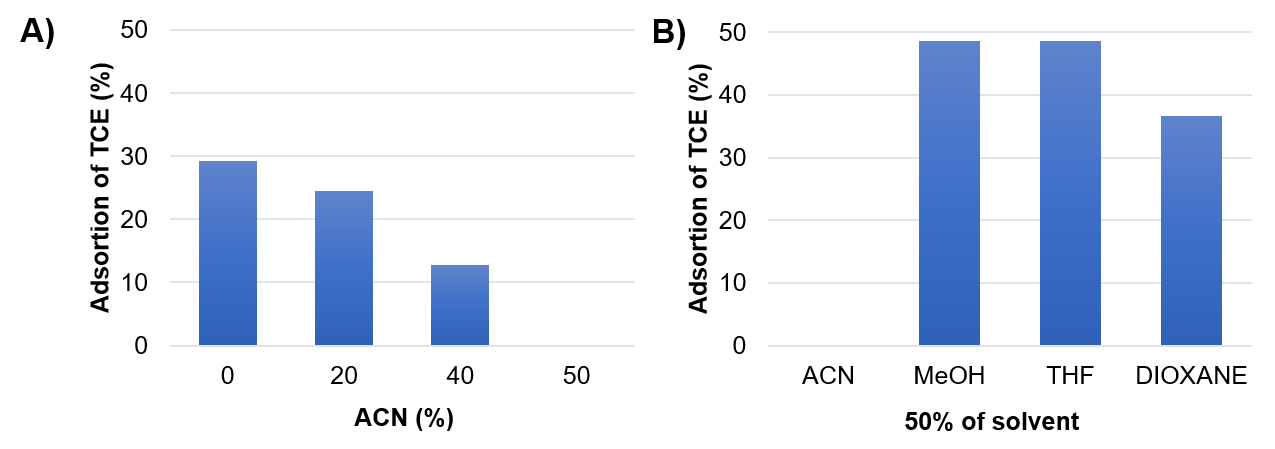
**Figure S2.** XPS analysis of **G@TLL-Cu2O** hybrid. **A**) XPS full spectrum. **B)** XPS spectrum of C1s, **C**) XPS spectrum of O1s. **D**) Cu LMM auger spectrum.

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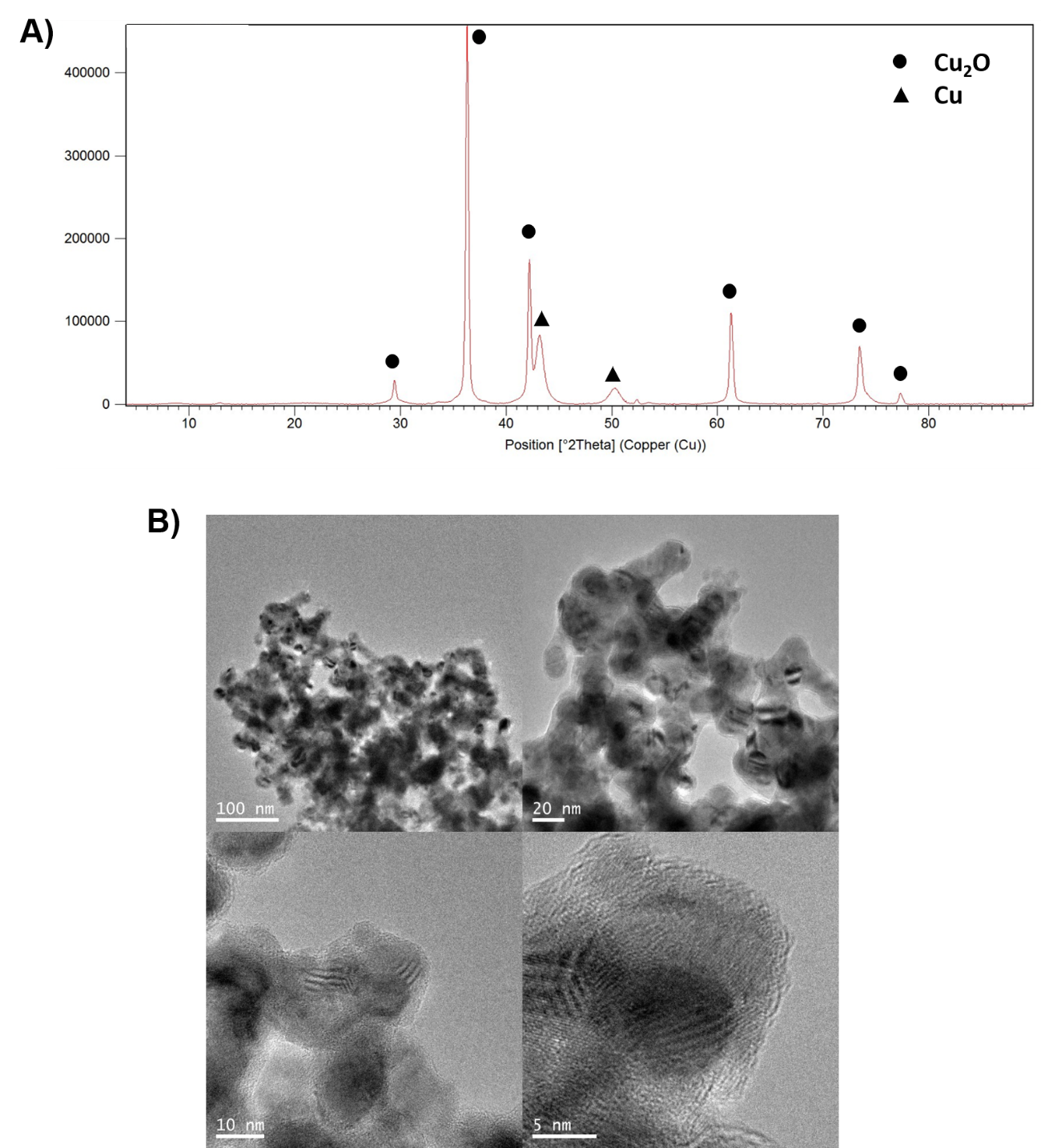
**Figure S3.** TEM images of **G@TLL-Cu2O** hybrid.

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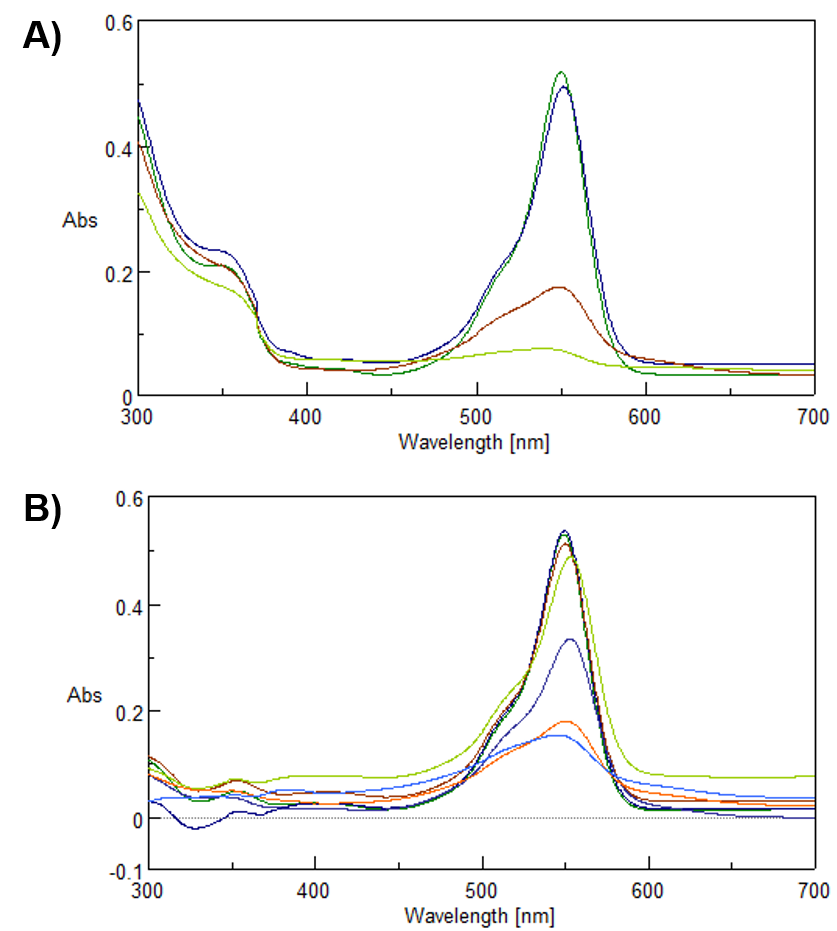
**Figure S4. A)** XRD spectra of the **G@TLL-Cu2O** hybrid incubated in different solvents and detergents; **B)** XRD spectra for **G@TLL-Cu2O** hybrid in SDS at 50 and 90 ºC; **C)** **1**-TLL, **2**-G@TLL, **3**- **G@TLL-Cu2O** pre-treated with SDS at 90ºC, **4**- **G@TLL-Cu2O** pre-treated with SDS at 50ºC, **5**- **G@TLL-Cu2O**.



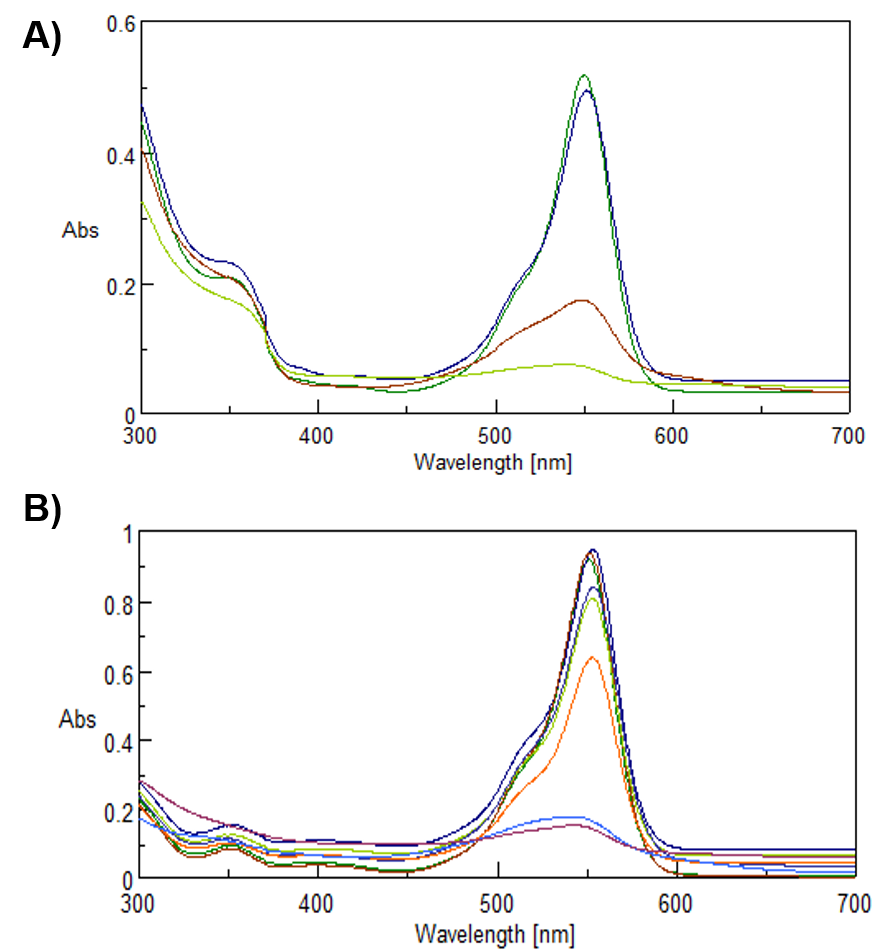
**Figure S5.** Study of adsorción of TCE to G@TLL in 1min. **A)** Differents concentrations of ACN; **B)** Differents solvents at 50:50 with water.



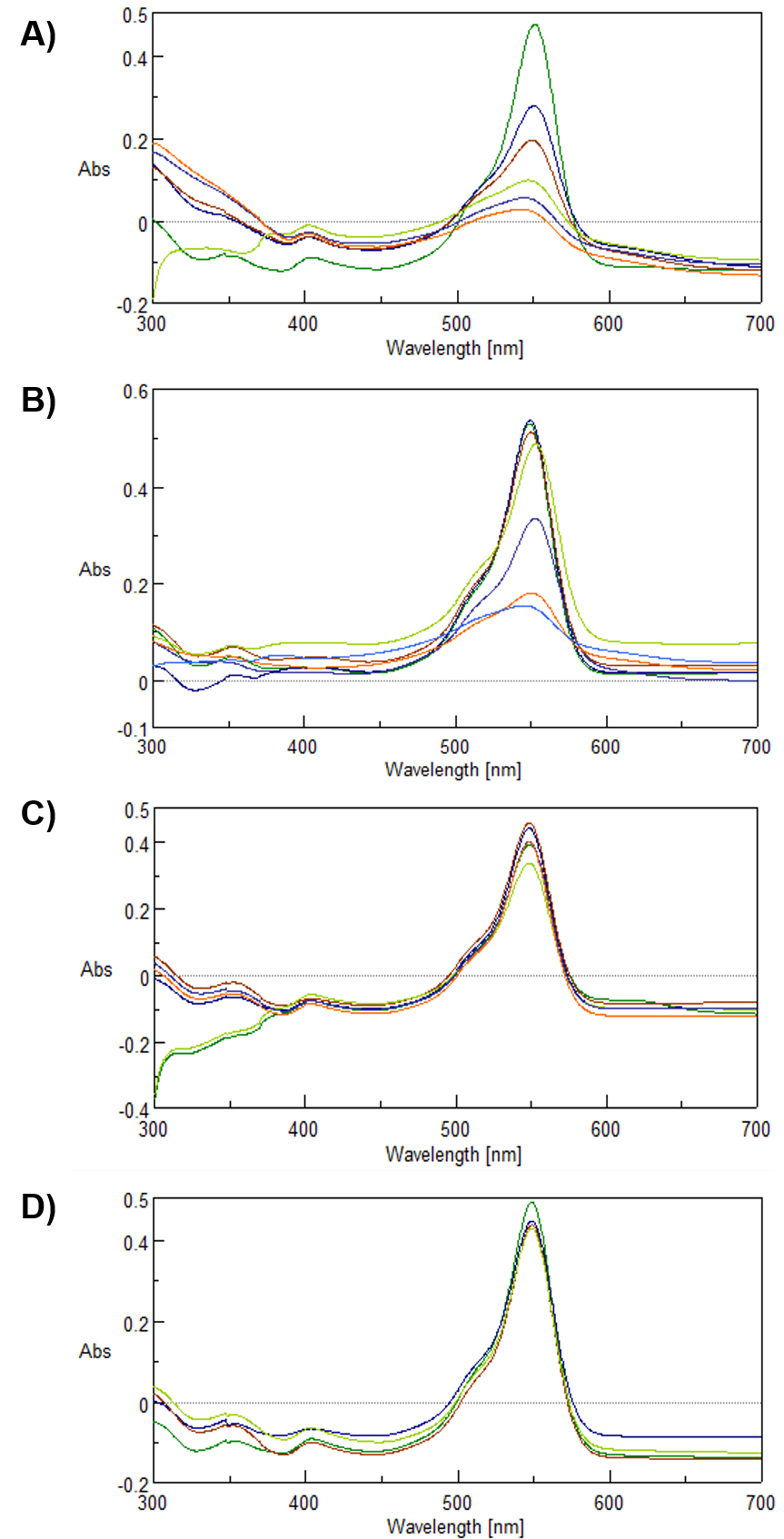
**Figure S6.** Characterization of **TLL-Cu2O** hybrid: **A)** XRD spectrum; **B)** TEM and HR-TEM images.



**Figura S7.** Effect of the amount of H2O2 with 5mg of **G@TLL-Cu2O** hybrid and 0.1mM of RhB: **A)** 250mM; **B)** 200mM.



**Figura S8.** Effect of the amount of **G@TLL-Cu2O** hybrid with 250mM of H2O2 and 0.1mM of RhB: **A)** 5mg; **B)** 10mg.



**Figura S9.** Effect of medium pH in the degradation of 0.1mM of RhB, conditions: 50:50 ACN:Buffer with 5mg of **G@TLL-Cu2O** hybrid and 250mM of H2O2: **A)** Buffer sodium acetate pH4; **B)** Distilled water; **C)** Buffer sodium phosphate pH7; **D)** Buffer sodium bicarbonate pH8.5.