SUPPLEMENTARY INFORMATION

1. Textural properties

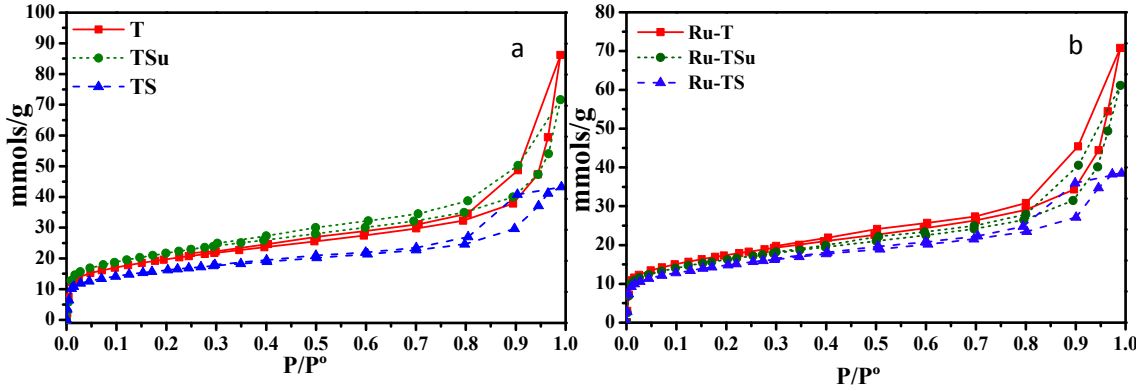

Figure S1. N_2 adsorption isotherms: a) of samples T, TSu, TS Ru-T, b) of samples Ru-TSu and Ru-TS.

2. TPD and titration correlation

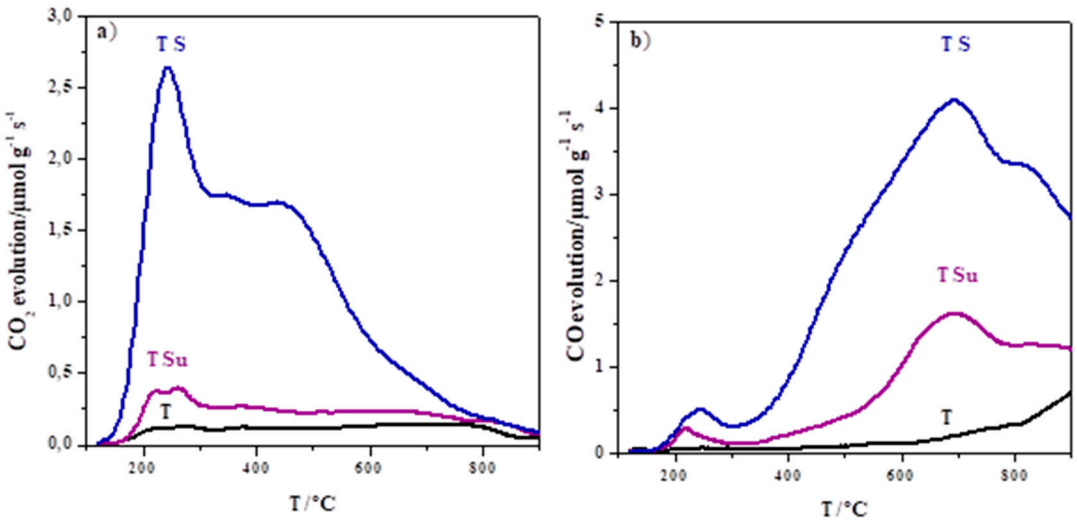

Figure S2. TPD profiles of samples T, TSu and TS: a) CO_2, b) CO.

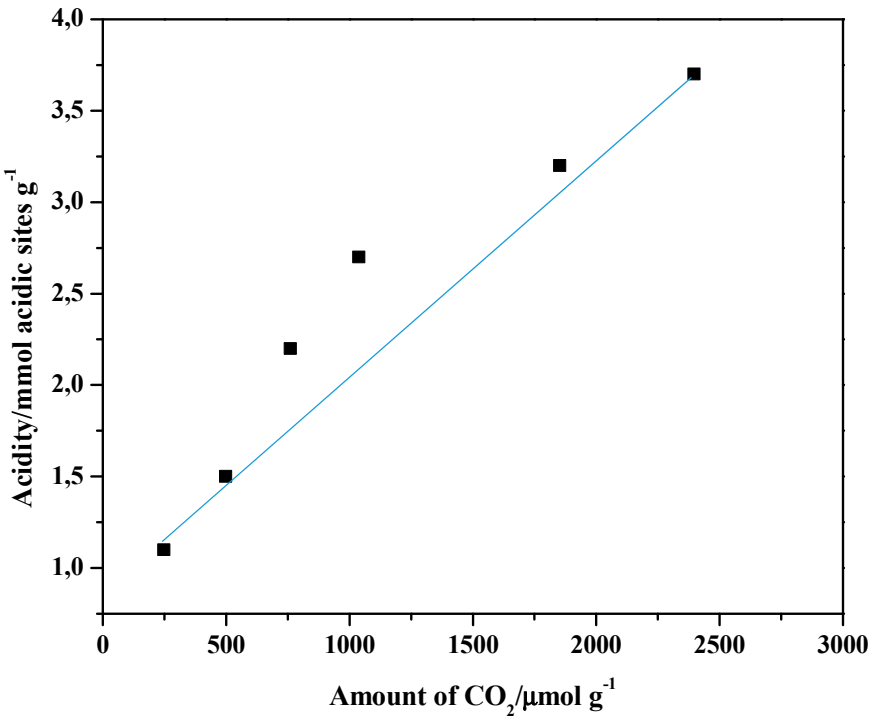

Figure S3. Total acidity (from titration measurements) vs amount of CO_2 determined by TPD (data of Table 2).

3. XPS

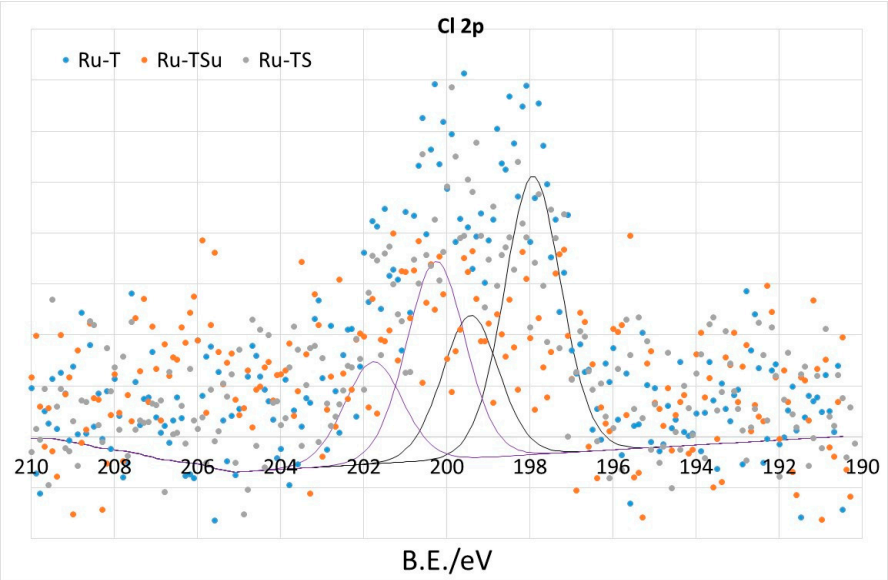

Figure S4. XPS data corresponding to Cl 2p in samples Ru-T, Ru-TSu and Ru-TS. The fitting curves shown are those obtaiened for catalyst Ru-T and are included only to show the position of the XPS signals.

4. TEM

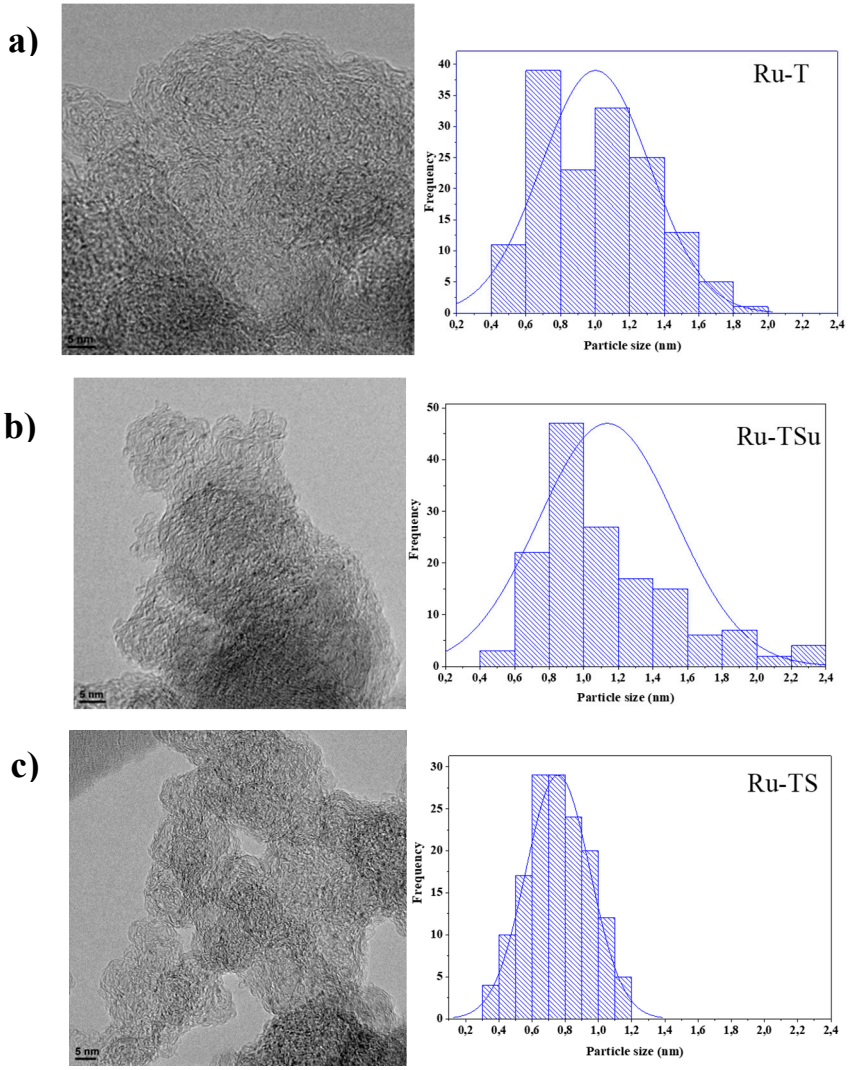

Figure S5. TEM images and Ru particle size distribution of catalysts (a) Ru-T, (b) Ru-TSu, and (c) Ru-T.

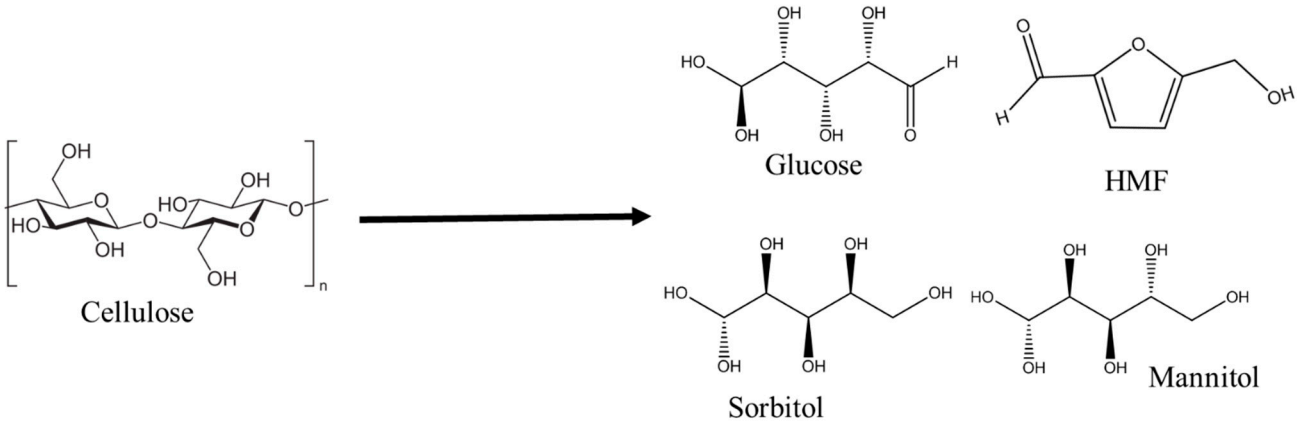

Figure S6. Schematic representation of the molecular form of the main reaction products.

InfoS1: BET and Dubinin-Radushkevich equations

BET equation

$$\frac{P/P_0}{n\left(1-P/P_0\right)} = \frac{1}{n_m \cdot C} + \frac{(C-1)}{n_m \cdot C}\frac{P}{P_0} \qquad (1)$$

Where:

P: is the pressure of the adsorbate gas.

P_0: is the saturation pressure of the adsorbate gas.

n: the adsorbed gas quantity at a relative pressure P/P_0.

n_m: is the monolayer capacity

C: is a constant, related to the adsorption heat.

It can be applied in the interval of relative pressures $0.05<P/P_0<0.3$. The representation of the left part of the equation against the relative pressure allows determining the adsorbed amount in the monolayer, n_m (mol/g), what allows to calculate a surface area.

Dubinin-Radushkevich equation

$$\frac{V}{V_0} = e^{\left(\frac{-1}{(E_0 \cdot \beta)^2}\left(RT \cdot \ln(P_0/P)\right)^2\right)} \qquad (2)$$

Where:

V is the volume of gas adsorbed at a pressure P,

V_0 is the volume of micropores,

E_0 is the characteristic energy of the adsorbent (dependent on the structure of the pore)

β is the affinity coefficient

P_0 is the saturation pressure of the adsorbate at the used temperature.

This equation is based on Polanyi's theory of potential, in which it is assumed that the condensation of the gas in the micropores occurs in the form of equipotential layers.