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ONE-POT CATALYTIC VALORIZATION OF BIOMASS TO ETHYLENE GLYCOL OVER GLUCOSE-DERIVED CARBON-BASED CATALYSTS

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Catalytic conversion of biomass is highly attractive for producing high added-value products, being ethylene glycol (EG) one of the most highlighted [1]. However, its production usually requires expensive metals (e.g., Ru) and carbon supports (e.g., carbon nanotubes (CNT), activated carbon). This work aimed to develop less expensive carbon-supported metal catalysts for the direct conversion of biomass to EG.

Glucose-based carbon materials were prepared by HTC. The materials were then carbonized (CG) or physically activated (AG_x) (Table 1). Ni-W catalysts were prepared by incipient wetness impregnation of the supports, and the one-pot conversion of cellulose/wastes to EG was performed in a reactor at 205 ºC and 50 bar of H_2. The prepared Ni-W catalysts were in general highly efficient, with 100 % cellulose conversion (X) (Table 1). Ni-W/AG_{1000} was the most efficient: EG yield (Y_{EG}) up to 60 %. These results surpassed previous works using Ru-W supported on CNT [2] or glucose-based materials [3], indicating that both CNT and Ru can be successfully replaced by low-cost alternatives. The best catalyst is also being evaluated for the conversion of wastes (e.g., paper, food waste), which so far resulted in EG yields up to 50 %. Thus, these materials are herein presented as low-cost and sustainable catalysts.

Table 1. Experimental conditions of the materials and catalytic results after 5 h.

Support	Gas type and flow rate	T (ºC)	t (h)	X (%)	Y_{EG} (%)
CG	N_2, 50 cm^3 min^{-1}	700	2	100	51.6
AG_{600}	CO_2, 80 cm^3 g^{-1} min^{-1}	700	2	100	41.8
AG_{1000}	CO_2, 80 cm^3 g^{-1} min^{-1}	900	2	100	59.5
AG_{2200}	CO_2, 80 cm^3 g^{-1} min^{-1}	900	6	100	56.3

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