# Electro-oxidation of waste glycerol to tartronic acid over Pt/CNT nanocatalyst: study of effect of reaction time on product distribution

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**ABSTRACT**

In this work, glycerol valorization into tartronic acid – one of the most valuable derivatives of glycerol – was reported over platinum supported on multi-walled carbon nanotubes (Pt/CNT) electrocatalyst. The nanocatalyst was synthesized using a chemical reduction method with hydrazine as a reducing agent. The physical analyses of catalyst were performed by BET, XRD, FESEM, EDX, and TEM. The XRD spectroscopy indicated a face centered cubic crystalline structure with an average crystallite size of 4.2 nm. The field emission scanning electron microscopy analysis revealed that the particles were uniformly distributed over multi-walled carbon nanotubes, while EDX showed the elemental composition of Pt (17.52%) and C (82.48%). Electrochemical activity and stability of the catalyst were measured using cyclic voltammetry and chronoamperometry techniques. Electrochemical surface area (ECSA, 226.52 m2/g) and mass activity (MA, 5.74 mA/mg) were calculated in 0.5 M H2SO4 and 0.5 M glycerol/0.5 M KOH solution, respectively. The catalytic activity of Pt/CNT nanoparticles was analyzed from glycerol oxidation reaction (GOR), while the products distribution and selectivity were measured using high-performance liquid chromatography (HPLC). It was found that the tartronic acid was produced as a major product with a selectivity of 95.3% while small quantities (<1%) of mesoxalic acid, dihydroxyacetone, and glyceric acid were also produced. The higher activity and selectivity of Pt/CNT can be attributed to high electrochemical surface area and uniform distribution over support.

**KEYWORDS**

Electrochemical surface area; glycerol oxidation reaction; HPLC; Pt/CNT; tartronic acid

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