

## Oxidation Activity of Platinum-Ruthenium-Tin Ternary Alloy Catalyst on Bio-Alcohol

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**Abstract :** In this study, the ternary alloy catalyst Pt<sub>20</sub>Ru<sub>x</sub>Sn<sub>y</sub> (where 20, x, y represent mass fractions of Pt, Ru, and Sn, respectively) was optimized for the preliminary study of bio-ethanol fuel cells (BAFC). The morphology, microstructure, composition, phase-structures, and electrochemical properties of Pt<sub>20</sub>Ru<sub>x</sub>Sn<sub>y</sub> catalyst were examined by SEM, TEM, EDS-mapping, XRD, and potentiostat. The effect of Sn content on electrochemical active surface (EAS) and oxidation activity were discussed. As a result, the additional Sn greatly improves the efficiency of Pt<sub>20</sub>Ru<sub>x</sub>Sn<sub>y</sub>, either x=0 or 10. Through discussing the difference between ethanol and glycol oxidations, the mechanism of tolerance against poisoning has been proved. Overall speaking, the catalytic activity are in the order of Pt<sub>20</sub>Ru<sub>x</sub>Sn<sub>y</sub> > Pt<sub>20</sub>Ru<sub>x</sub> > Pt<sub>20</sub>Sn<sub>y</sub> in both ethanol and glycol systems. Finally, Pt<sub>20</sub>Ru<sub>10</sub>Sn<sub>15</sub> catalyst was successfully applied to demonstrate the feasibility of using bio-alcohol.

**Keywords :** Pt-Sn alloy catalyst, Pt-Ru-Sn alloy catalyst, fuel cell, ethanol, ethylene glycol

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