

## Water Gas Shift Activity of PtBi/CeO<sub>2</sub> Catalysts for Hydrogen Production

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**Abstract :** The influence of bismuth on the water gas shift activities of Pt on ceria was studied. The flow reactor was used to study the activity of the catalysts in temperature range 100-400°C. The feed gas composition contains 5%CO, 10% H<sub>2</sub>O and balance N<sub>2</sub>. The total flow rate was 100 mL/min. The outlet gas was analyzed by on-line gas chromatography with thermal conductivity detector. The catalytic activities of bimetallic 1%Pt1%Bi/CeO<sub>2</sub> catalyst were greatly enhanced when compared with the activities of monometallic 2%Pt/CeO<sub>2</sub> catalyst. The catalysts were characterized by X-ray diffraction (XRD), Temperature-Programmed Reduction (TPR) and surface area analysis. X-ray diffraction pattern of Pt/CeO<sub>2</sub> and PtBi/CeO<sub>2</sub> indicated slightly shift of diffraction angle when compared with pure ceria. This result was due to strong metal-support interaction between platinum and ceria solid solution, causing conversion of Ce<sup>4+</sup> to larger Ce<sup>3+</sup>. The distortions inside ceria lattice structure generated strain into the oxide lattice and facilitated the formation of oxygen vacancies which help to increase water gas shift performance. The H<sub>2</sub>-Temperature Programmed Reduction indicated that the reduction peak of surface oxygen of 1%Pt1%Bi/CeO<sub>2</sub> shifts to lower temperature than that of 2%Pt/CeO<sub>2</sub> causing the enhancement of the water gas shift activity of this catalyst. Pt played an important role in catalyzing the surface reduction of ceria and addition of Bi alter the reduction temperature of surface ceria resulting in the improvement of the water gas shift activity of Pt catalyst.

**Keywords :** bismuth, platinum, water gas shift, ceria

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