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**APPENDIX**  
**EXPERIMENTAL DATA**

**1. Activity of Pd/CeO<sub>2</sub> Catalyst**

The catalysts were characterized by BET and XRD to determine their surface areas and the phase of the surface. Tables A.1 - A.3 show the BET surface areas of the Pd/CeO<sub>2</sub> catalysts.

**Table A.1** BET surface area of 1%Pd/CeO<sub>2</sub> catalyst.

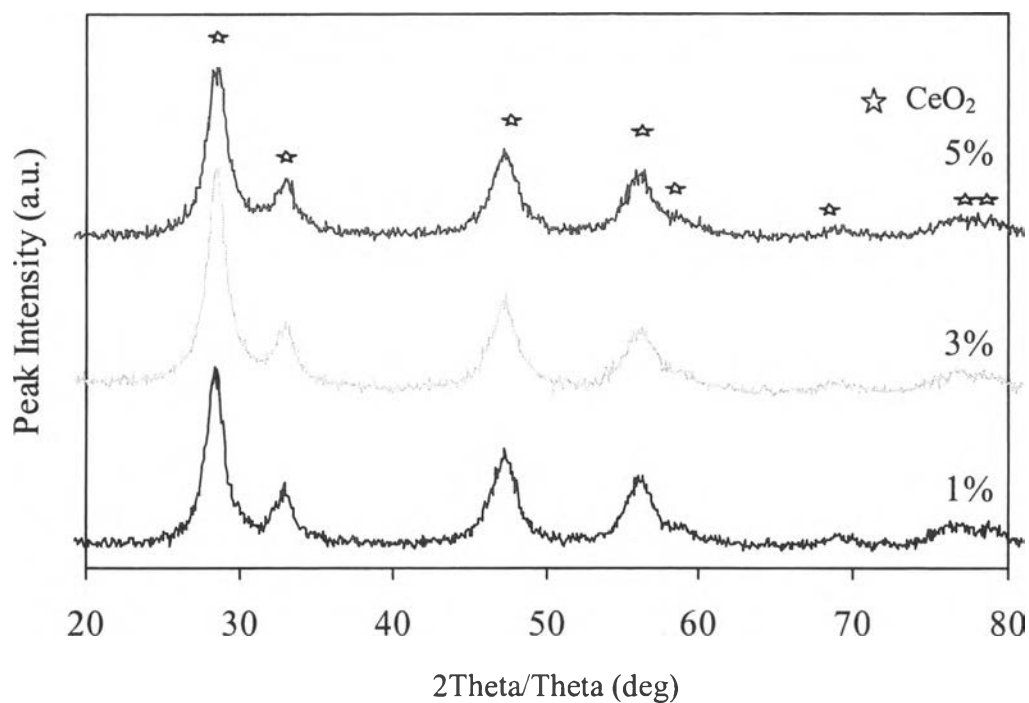
<b>Catalyst preparation method</b>	<b>BET surface area (m<sup>2</sup>/g)</b>
Co-precipitation	98.8
Impregnation	105.7

**Table A.2** BET surface area of Pd/CeO<sub>2</sub> co-precipitation catalyst calcined at 300°C for 2 h with different Pd loadings.

<b>% Pd loading</b>	<b>BET surface area (m<sup>2</sup>/g)</b>
1	98.80
3	91.93
5	95.42

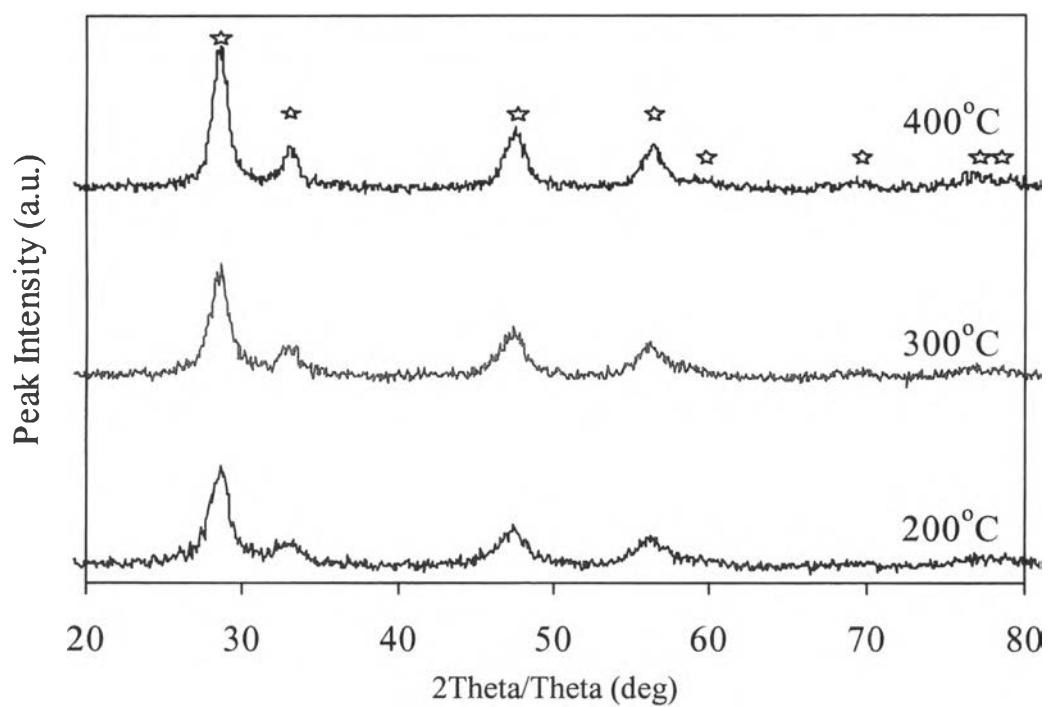
**Table A.3** BET surface area of 1%Pd/CeO<sub>2</sub> co-precipitation catalyst at different calcination temperatures.

Calcination temperature (°C)	BET surface area (m <sup>2</sup> /g)
200	128.50
300	98.80
400	85.99

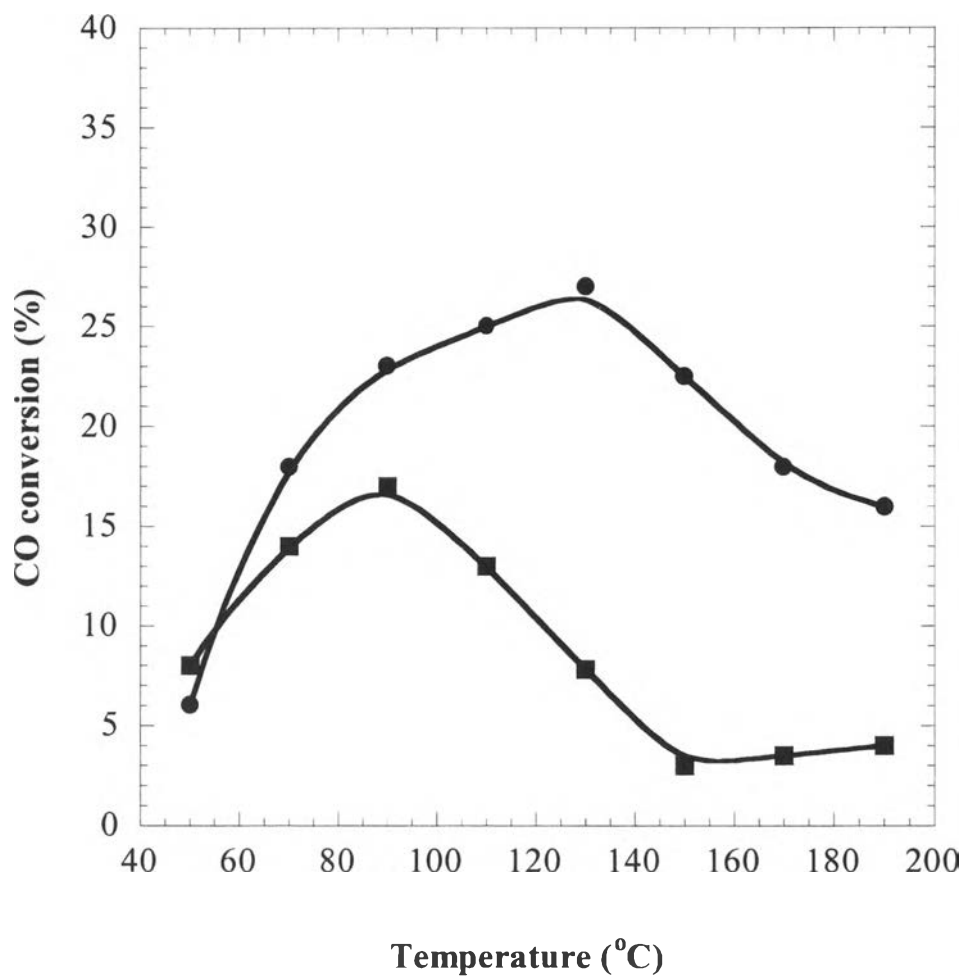


**Figure A.1** XRD patterns of Pd/CeO<sub>2</sub> (1%, 3%, and 5%) co-precipitation catalysts with different Pd loadings calcined at 300°C for 2 h.

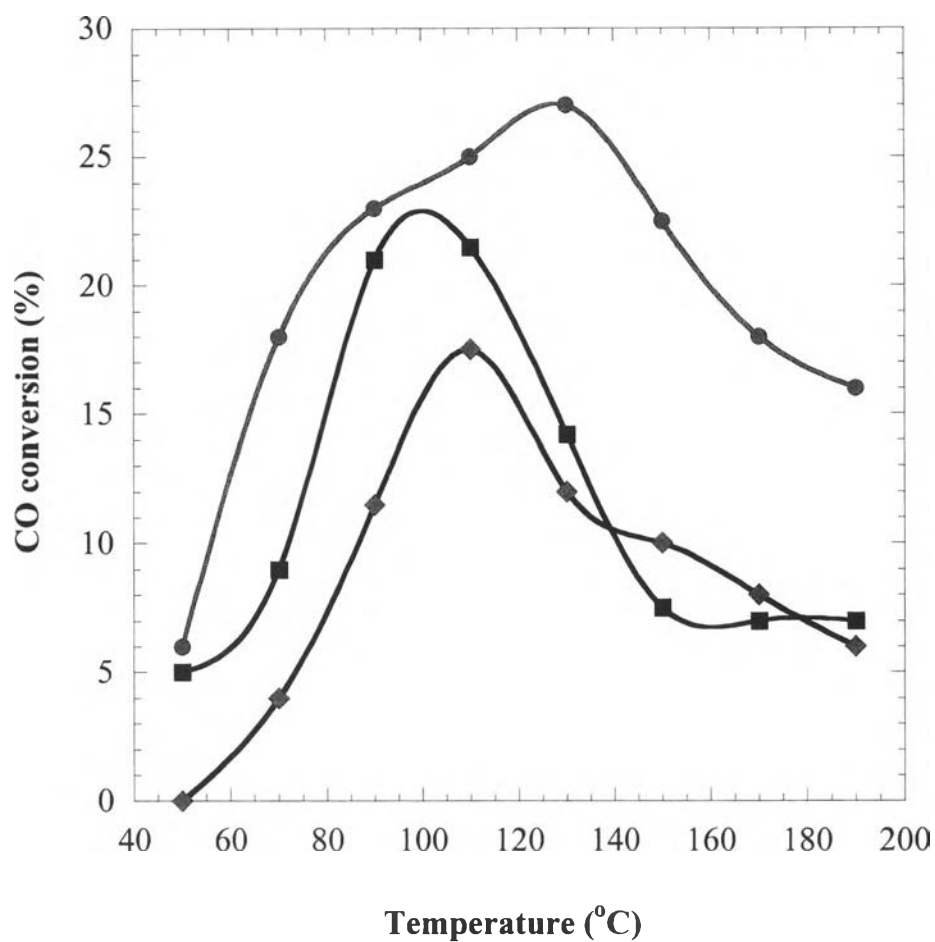




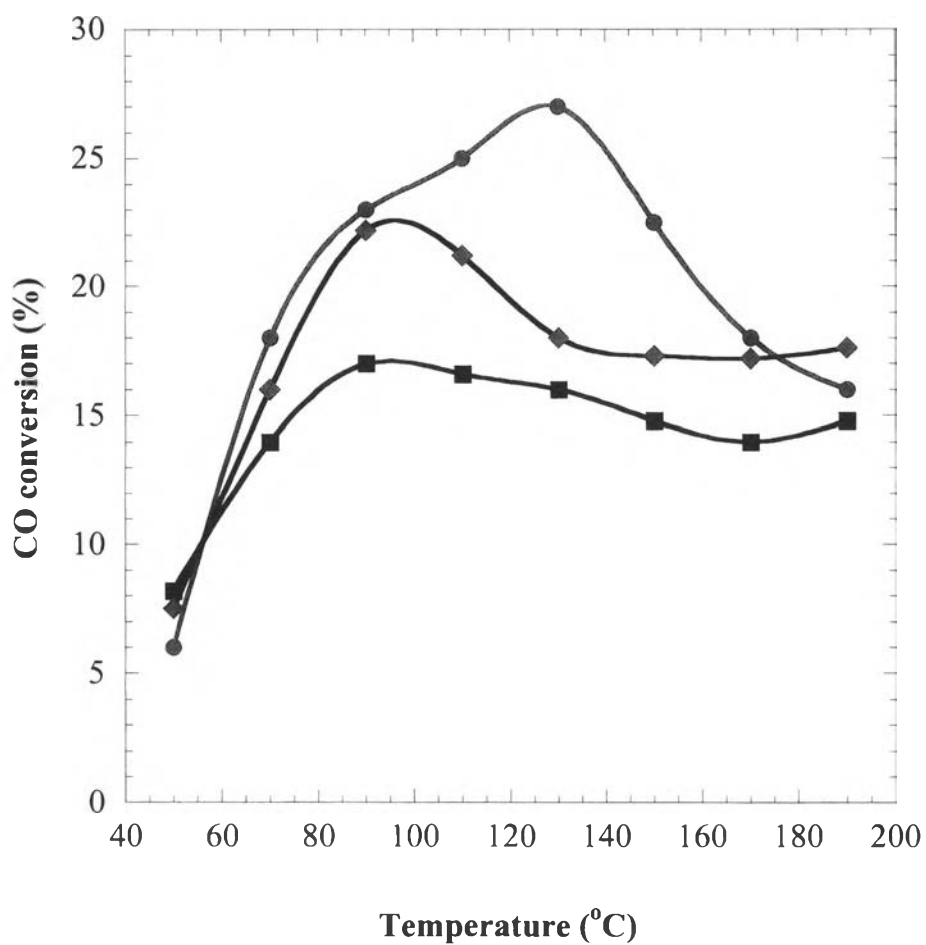
**Figure A.2** XRD patterns of 1%Pd/CeO<sub>2</sub> co-precipitation catalysts at different calcination temperatures (200, 300, and 400°C for 2 h.).



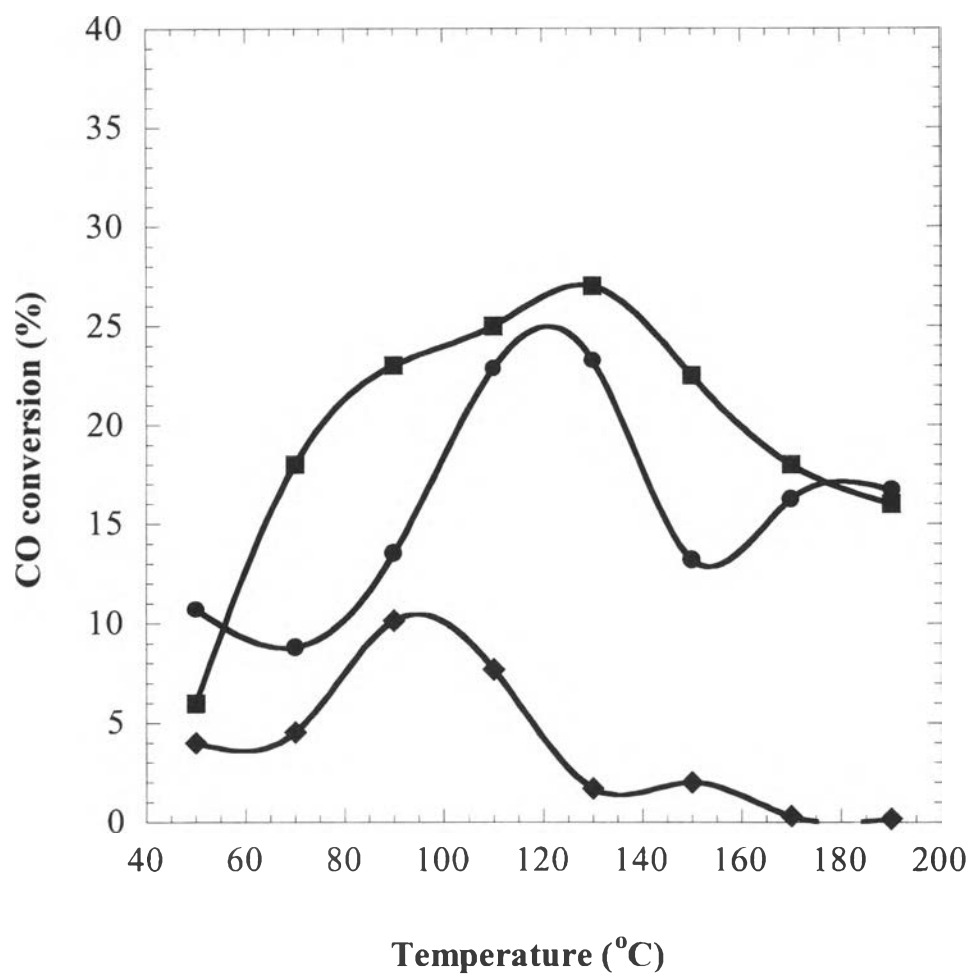
**Figure A.3** Effect of catalyst preparation on CO conversion of 1%Pd/CeO<sub>2</sub> catalysts. Reactant composition: 1% CO, 1% O<sub>2</sub>, 2% CO<sub>2</sub>, 2.6% H<sub>2</sub>O, 40% H<sub>2</sub> and helium; (●) co-precipitation; (■) impregnation.



**Figure A.4** Effect of pretreatment method on CO conversion of 1%Pd/CeO<sub>2</sub> co-precipitation catalysts. Reactant composition: 1% CO, 1% O<sub>2</sub>, 2% CO<sub>2</sub>, 2.6% H<sub>2</sub>O, 40% H<sub>2</sub> and helium; (●) 10%H<sub>2</sub> pretreatment at 300°C 3 h; (■) pure H<sub>2</sub> pretreatment at 300°C 3 h; (◆) pure O<sub>2</sub> pretreatment at 300°C 3 h.



**Figure A.5** Effect of Pd loading on CO conversion of 1%Pd/CeO<sub>2</sub> co-precipitation catalysts. Reactant composition: 1% CO, 1% O<sub>2</sub>, 2% CO<sub>2</sub>, 2.6% H<sub>2</sub>O, 40% H<sub>2</sub> and helium; (●) 1%Pd; (■) 3%Pd; (◆) 5%Pd.



**Figure A.6** Effect of calcination temperature on CO conversion of 1%Pd/CeO<sub>2</sub> co-precipitation catalysts. Reactant composition: 1% CO, 1% O<sub>2</sub>, 2% CO<sub>2</sub>, 2.6% H<sub>2</sub>O, 40% H<sub>2</sub> and helium; (●) 200°C; (■) 300°C; (◆) 400°C.

## CURRICULUM VITAE

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**University Education:**

1987-1990 Bachelor Degree of Science in Chemistry, Prince of Songkla University, Songkla, Thailand.

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1990-1993 Position: Researcher  
Company name: Bangkok Rubber Co.,Ltd.

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**Publications:**

1. Luengnaruemitchai, A., Osuwan, S., and Gulari, E. (2003) Comparative studies of low-temperature water gas shift reaction over Pt/CeO<sub>2</sub>, Au/CeO<sub>2</sub>, and Au/Fe<sub>2</sub>O<sub>3</sub> catalysts. Catalysis Communications, 4, 215-221.

2. Luengnaruemitchai, A., Osuwan, S., and Gulari, E. (2003) Selective Catalytic Oxidation of CO in the Presence of H<sub>2</sub> over Gold Catalyst. International Journal of Hydrogen Energy, In press.

### **Proceedings**

1. Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. Selective oxidation of carbon monoxide in the presence of hydrogen over Pt/CeO<sub>2</sub>. Proceedings of the 10<sup>th</sup> National Chemical Engineering and Applied Chemistry Conference. Bangkok, Thailand, October 26-28, 2000: 505-510.
2. Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. New catalysts for selective oxidation of carbon monoxide in the presence of hydrogen. Proceedings of Regional Symposium on Chemical Engineering 2000. NUS Guild House, Singapore, December 11-13, 2000: CD ROM.
3. Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. Selective CO oxidation in the presence of hydrogen over Au/CeO<sub>2</sub> catalyst. Proceedings of the 6<sup>th</sup> World Congress of Chemical Engineering. Melbourne, Australia, September 23-27, 2001 : CD ROM.
4. Dao Thi Kim Thoa, Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. Selective CO oxidation in hydrogen rich stream over Au/MnO<sub>x</sub> and Au/FeO<sub>x</sub> catalysts. Advances in petrochemicals and polymers in the new millennium. Bangkok, Thailand, July 22-25, 2003 : CD ROM.
5. Dao Thi Kim Thoa, Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. Selective catalytic oxidation of CO in the presence of H<sub>2</sub>:Effect of support on gold catalyst. First International Intensification and Miniaturisation. University of Newcastle upon Tyne, Newcastle, UK, August 18-21, 2003 : CD ROM.

**Presentations**

1. Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. Selective oxidation of carbon monoxide in the presence of hydrogen over Pt/CeO<sub>2</sub>. AICHE 2000 Annual Meeting. Los Angeles, USA, November 12-17, 2000.
2. Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. Low temperature water-gas shift reaction over Pt/CeO<sub>2</sub> and Au/CeO<sub>2</sub> catalysts. AICHE 2001 Annual Meeting. Reno, USA, November 4-8, 2001.
3. Apanee Luengnaruemitchai, Somchai Osuwan, and Erdogan Gulari. Selective catalytic oxidation of CO in the presence of H<sub>2</sub>: Effect of support on platinum catalysts, 85th Canadian Society for Chemistry (CSC) Conference and Exhibition. Vancouver, Canada, June 1-5, 2002.