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APPENDICES

Appendix A TPD Profiles of $LiAlH_4$ Mixed and Unmixed with CAs and Catalysts

TPD curves were used to investigate the thermal desorption behaviour of mixed and unmixed $LiAlH_4$, which was carried out at room temperature to 250 °C with a heating rate of 10 °C/min and hold at 250 °C for 1 h under a nitrogen flow. TPD curves exhibit two peaks of desorption temperature for all tested samples.

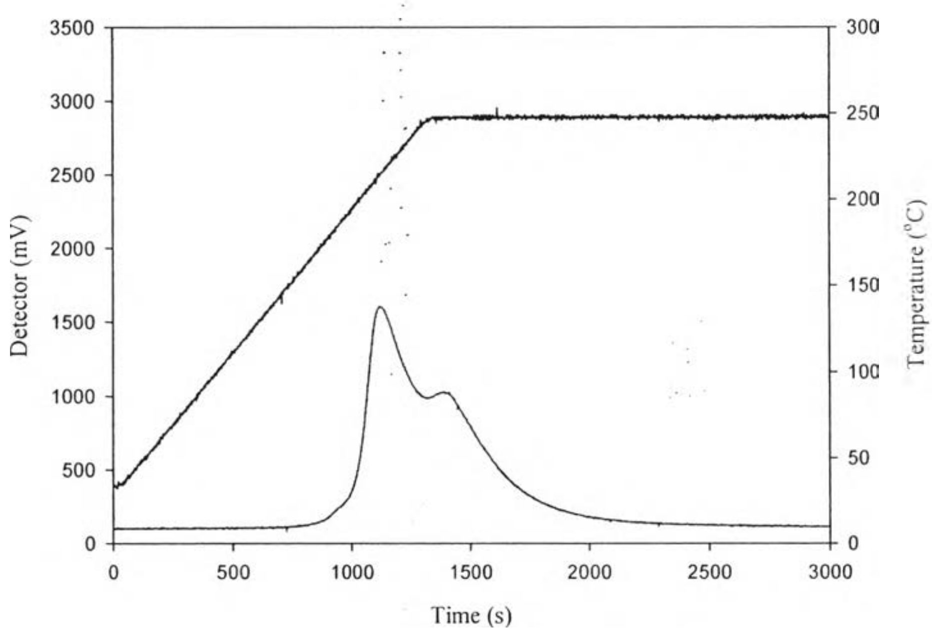

Figure A1 TPD curves of as-received $LiAlH_4$.

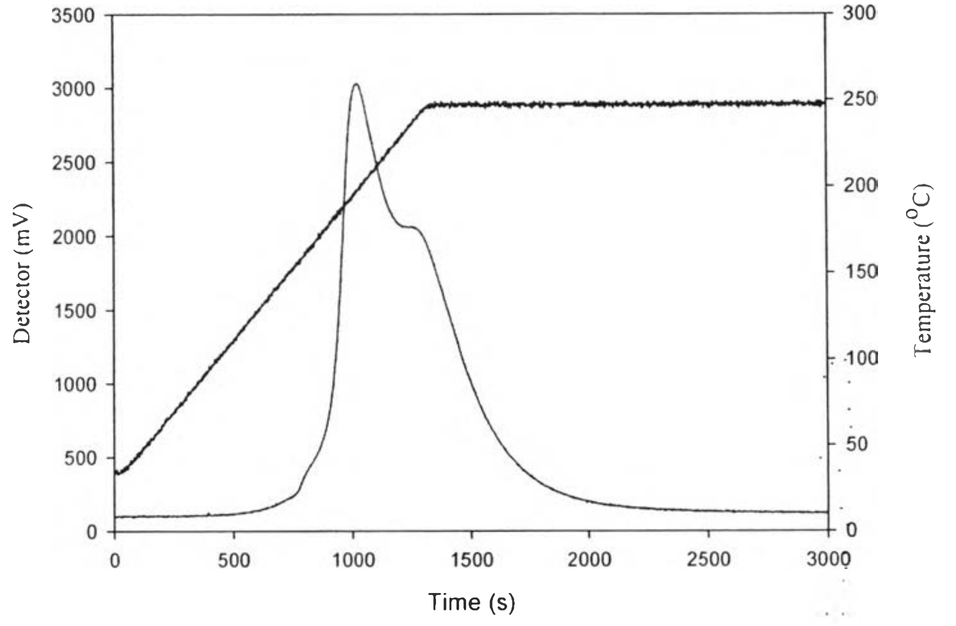

Figure A2 TPD curves of milled $LiAlH_4$.

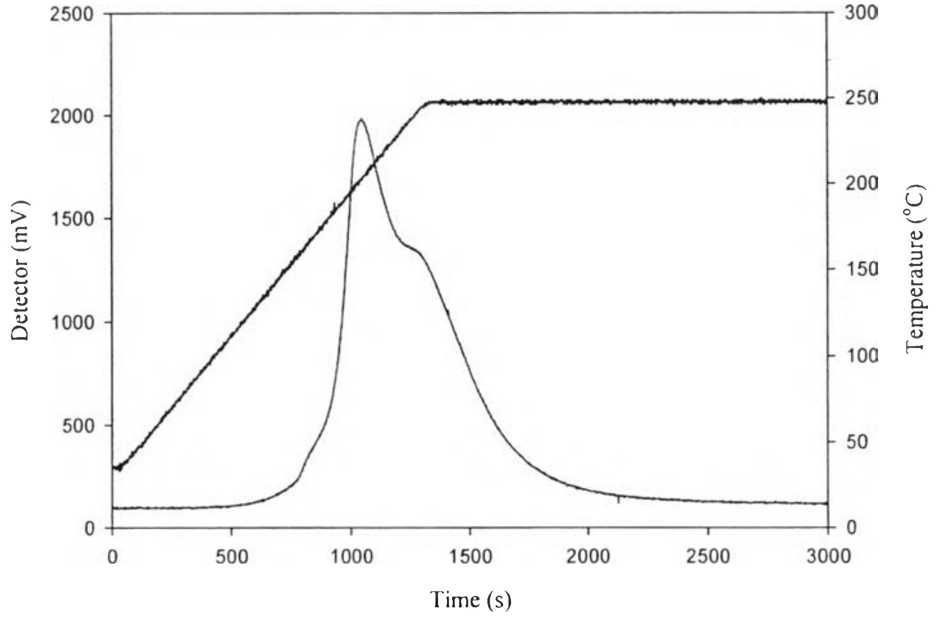

Figure A3 TPD curves of $LiAlH_4$ mixed with 5 wt% CAs.

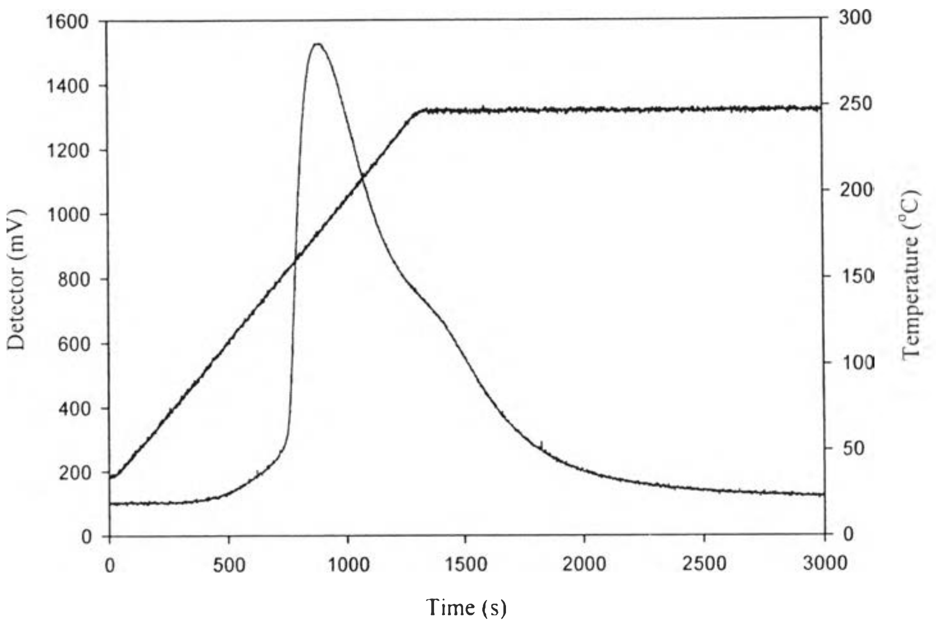

Figure A4 TPD curves of $LiAlH_4$ mixed with 10 wt% CAs.

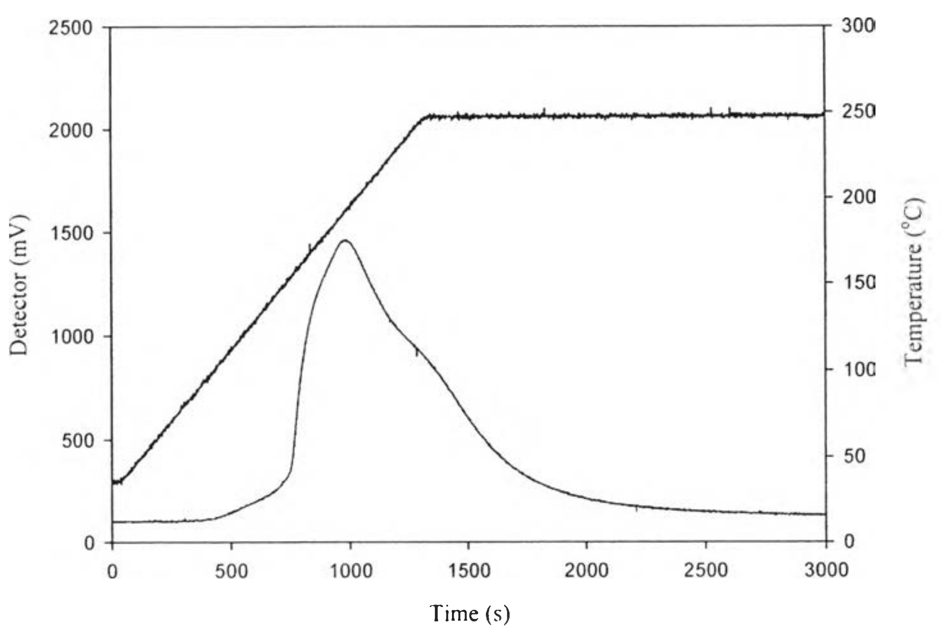

Figure A5 TPD curves of $LiAlH_4$ mixed with 15 wt% CAs.

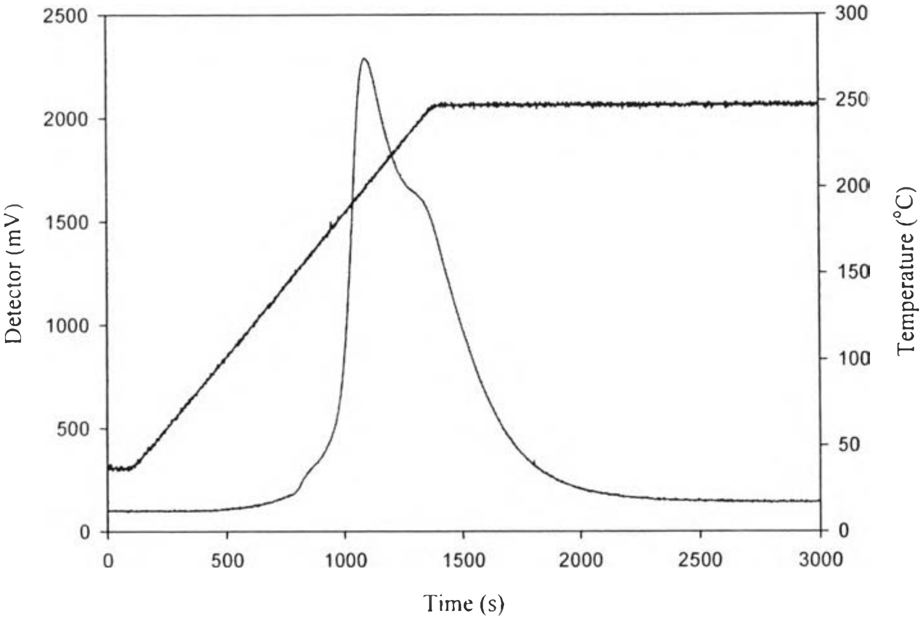

Figure A6 TPD curves of $LiAlH_4$ mixed with 5 wt% Ti.

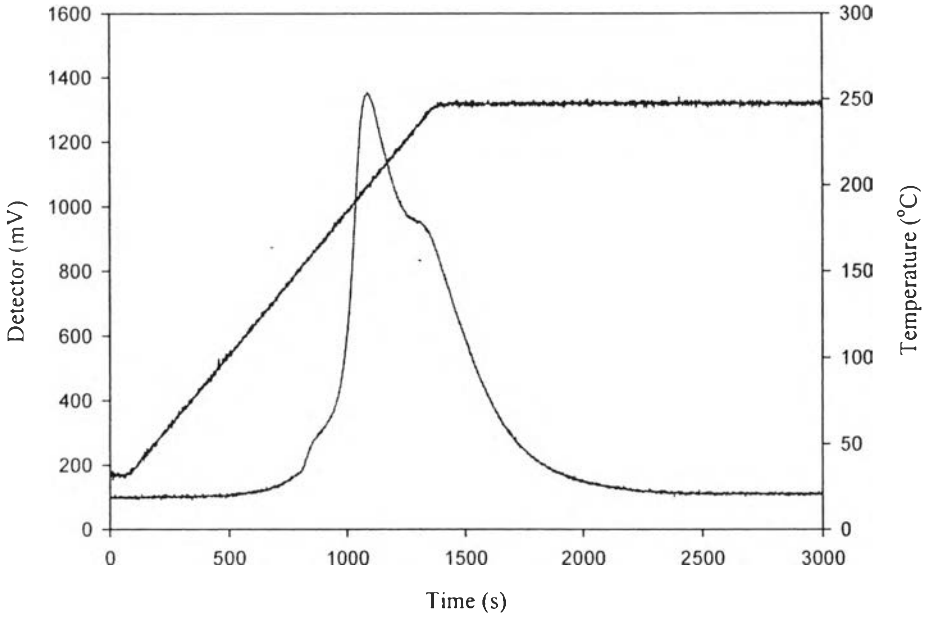

Figure A7 TPD curves of $LiAlH_4$ mixed with 5 wt% Ni.

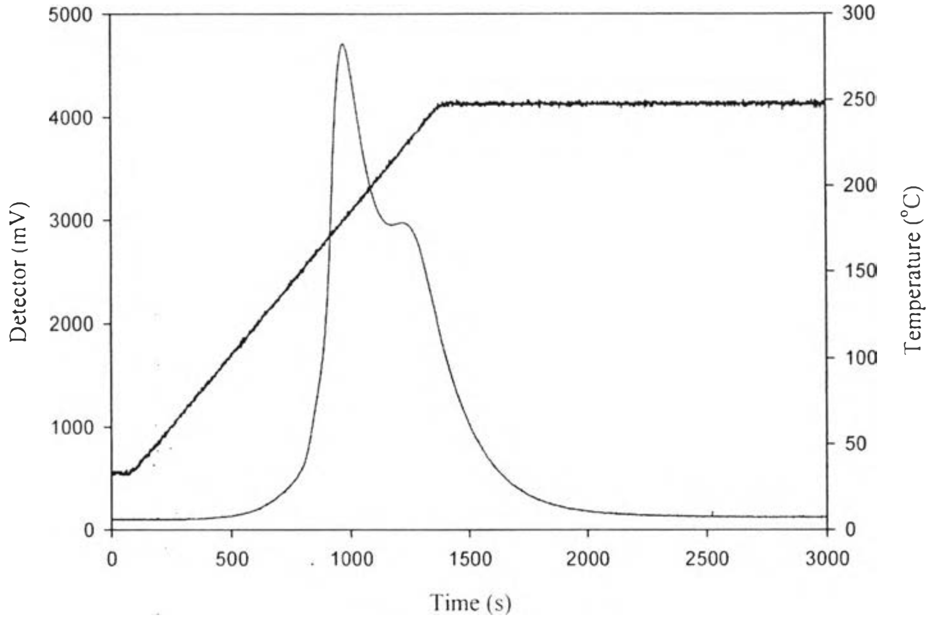

Figure A8 TPD curves of $LiAlH_4$ mixed with 5 wt% TiO_2.

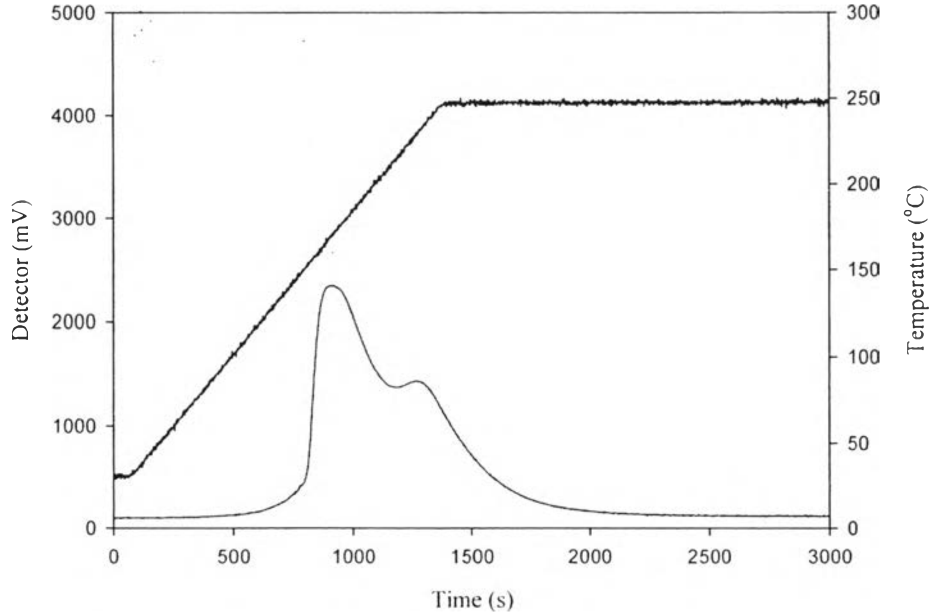

Figure A9 TPD curves of $LiAlH_4$ mixed with 5 wt% $TiCl_3$.

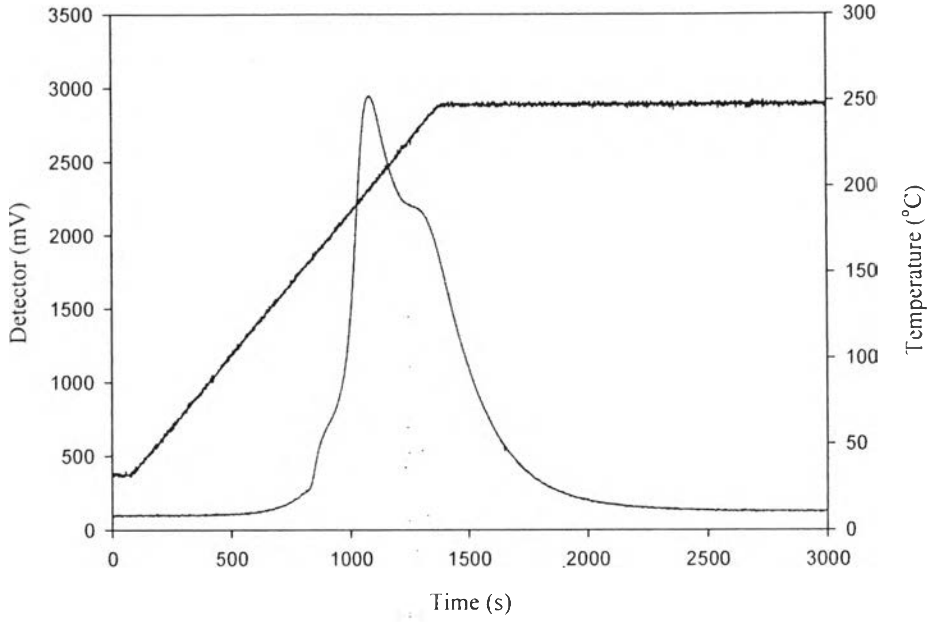

Figure A10 TPD curves of $LiAlH_4$ mixed with 5wt%Ti-5wt%CAs.

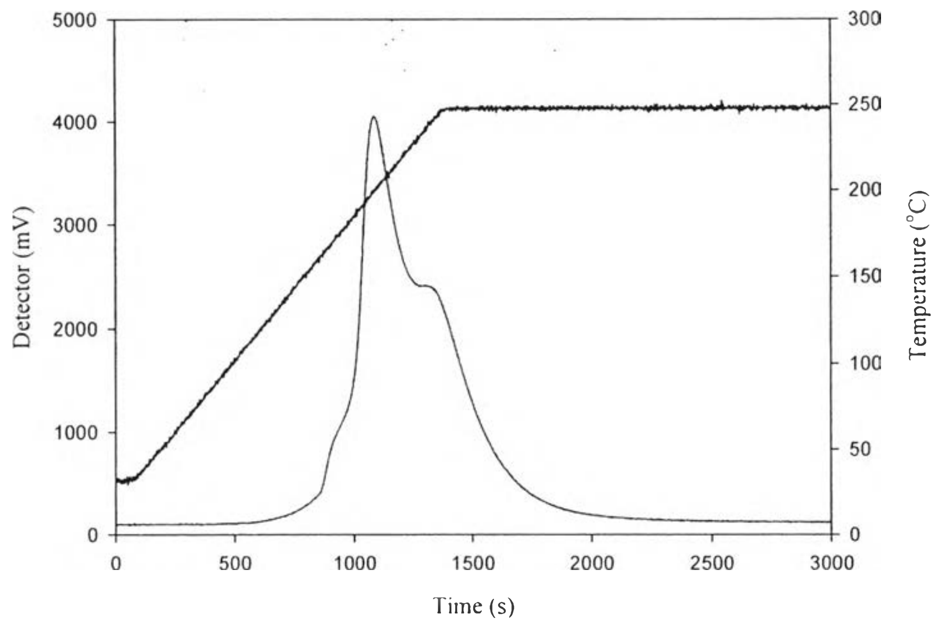

Figure A11 TPD curves of $LiAlH_4$ mixed with 5wt%Ni-5wt%CAs.

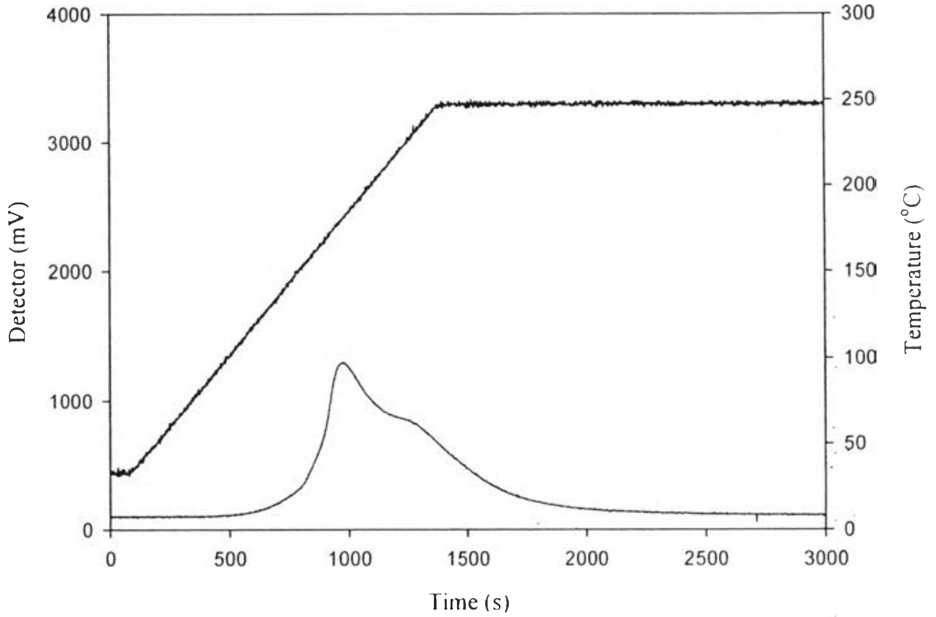

Figure A12 TPD curves of $LiAlH_4$ mixed with 5wt%TiO_2-5wt%CAs.

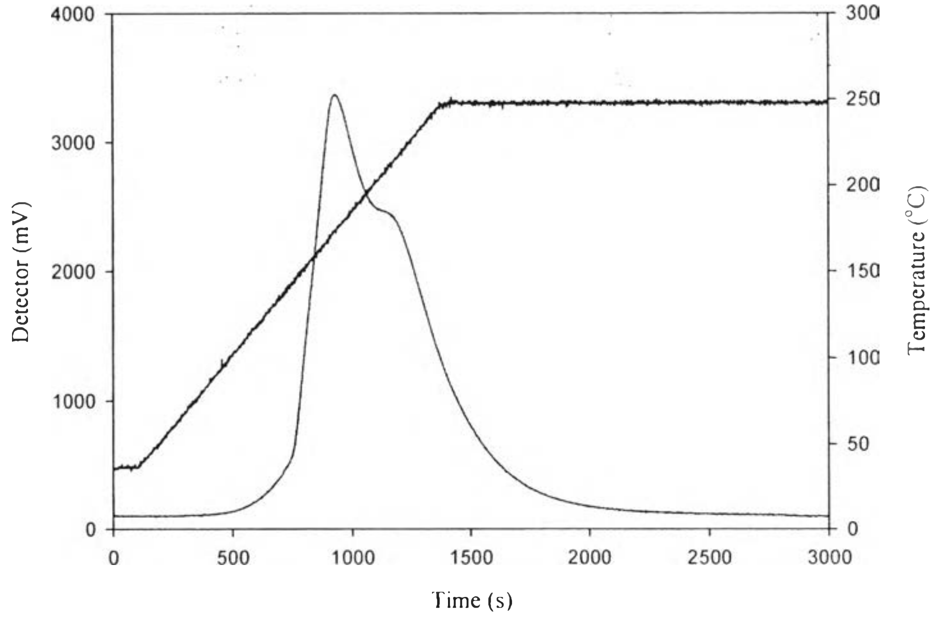

Figure A13 TPD curves of $LiAlH_4$ mixed with 5wt%$TiCl_3$-5wt%CAs.

Appendix B Changed Pressure during the Desorption

Table B1 Changed pressure of as-received $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	0
130	0
150	5.128
170	88.645
190	120.879
210	154.579
230	161.172
250	164.835

Table B2 Changed pressure of milled $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	0
130	0
150	9.524
170	92.308
190	119.414
210	145.788
230	151.648
250	153.846

Table B3 Changed pressure of mixing 5 wt% CAs with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	0
130	0
150	5.861
170	92.674
190	108.425
210	135.531
230	142.857
250	144.322

Table B4 Changed pressure of mixing 10 wt% CAs with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	0
130	1.465
150	21.246
170	88.645
190	105.495
210	130.43
230	135.531
250	138.462

Table B5 Changed pressure of mixing 15 wt% CAs with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	0
130	12.454
150	60.806
170	95.238
190	117.216
210	131.136
230	134.799
250	139.927

Table B6 Changed pressure of mixing 5 wt% Ti with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	1.465
130	10.256
150	38.828
170	109.158
190	134.066
210	152.381
230	154.579
250	156.777

Table B7 Changed pressure of mixing 5 wt% TiO_2 with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	11.355
130	41.026
150	95.971
170	129.67
190	156.044
210	159.707
230	161.172
250	163.37

Table B8 Changed pressure of mixing 5 wt% $TiCl_3$ with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	7.326
130	39.194
150	96.703
170	125.275
190	150.916
210	152.381
230	152.381
250	153.114

Table B9 Changed pressure of mixing 5 wt% Ni with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	2.93
130	16.117
150	70.33
170	112.821
190	139.927
210	154.579
230	157.509
250	158.974

Table B10 Changed pressure of co-mixing 5 wt% CAs and 5 wt% Ti with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	2.93
130	15.385
150	56.41
170	95.971
190	118.681
210	131.136
230	136.996
250	138.462

Table B11 Changed pressure of co-mixing 5 wt% CAs and 5 wt% TiO_2 with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	7.326
130	28.571
150	64.469
170	86.447
190	101.099
210	105.495
230	106.227
250	106.96

Table B12 Changed pressure of co-mixing 5 wt% CAs and 5 wt% $TiCl_3$ with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	5.86
130	31.502
150	85.714
170	112.088
190	132.601
210	142.857
230	144.322
250	146.52

Table B13 Changed pressure of co-mixing 5 wt% CAs and 5 wt% Ni with $LiAlH_4$

Temperature (°C)	Pressure (psi)
30	0
50	0
70	0
90	0
110	3.297
130	15.018
150	68.865
170	106.96
190	131.136
210	143.59
230	147.985
250	149.451

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2. Purasaka P., Chaisuwan T., Rangsunvigit P., Kitiyanan B., and Kulprathipanja S. (2011, April 26) Roles of carbon aerogels and catalysts on the hydrogen desorption behaviors of $LiAlH_4$, the 2nd Research Symposium on Petroleum, Petrochemicals, and Advanced Materials, and the 17th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

Presentations:

1. Purasaka P., Phadthaisong P., and Ngaotrakanwiwat P., (2008, Oct 20-21) Physical and Optical Properties of TiO_2 Synthesized by Sol-gel Technique, Oral presented at 18th Thailand Chemical Engineering and Applied Chemistry conference (TIChE 18), Pattaya, Bangkok, Thailand.
2. Purasaka P., Chaisuwan T., Rangsunvigit P., Kitiyanan B., and Kulprathipanja S. (2011, April 26) Roles of carbon aerogels and catalysts on the hydrogen desorption behaviors of $LiAlH_4$, Poster presented at the 2nd Research Symposium

on Petroleum, Petrochemicals, and Advanced Materials, and the 17th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.