



# Increased Throughput Delivered by the New H-Cube Pro™

## Hydrogenation of 2,4-dinitroanisole: A Comparative Study with the H-Cube®

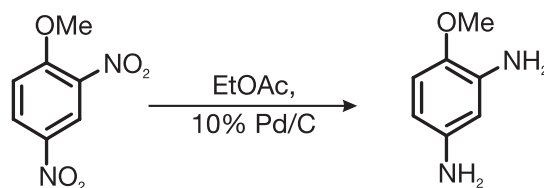
The H-Cube Pro™ improves upon the original H-Cube® by offering greater hydrogen production (up to 60 mL/min) for higher throughput, wider temperature range (from 10 - 150 °C) including - for the first time - active cooling for more selective reactions. Importantly, reactants can be hydrogenated at higher concentrations with a 70 mm CatCart® that is uniformly heated, regardless of flow rate.

Users may vary the amount of hydrogen produced at each pressure level between 0 and 60 mL/min offering greater reaction control. In this application note, we compare the H-Cube® with the new H-Cube Pro™ in terms of throughput. The aim is to see how much more concentrated we can run a reaction on the H-Cube Pro™ by taking advantage of the greater hydrogen production capability. The reduction of 2,4-dinitroanisole was chosen as a model reaction because the reaction has high hydrogen demand (6 mol H<sub>2</sub> per 1 mol substrate) since it involves the reduction of two nitro groups. The comparative study results are displayed in Table 1.

Table 1.

Instrument	Conc. (mol/L)	T (°C)	p (bar)	H <sub>2</sub> production (%)	Product (%)**
H-Cube®	0.05	100	100	7	38
H-Cube®	0.10	100	100	7	24
H-Cube®	0.15	100	100	7	9
<b>H-Cube Pro™</b>	<b>0.10</b>	<b>150</b>	<b>100</b>	<b>7</b>	<b>21</b>
H-Cube®	0.05	50	1	100*	> 99***
H-Cube®	0.07	50	1	100*	58
H-Cube®	0.10	50	1	100*	41
<b>H-Cube Pro™</b>	<b>0.10</b>	<b>50</b>	<b>1</b>	<b>100</b>	<b>&gt; 99</b>
<b>H-Cube Pro™</b>	<b>0.10</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>&gt; 99</b>
<b>H-Cube Pro™</b>	<b>0.12</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>&gt; 99</b>
<b>H-Cube Pro™</b>	<b>0.14</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>&gt; 99***</b>
<b>H-Cube Pro™</b>	<b>0.15</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>80</b>

\*Refers to Full H<sub>2</sub> mode \*\*Analyzed by LC-MS \*\*\*Isolated yield and purity of the crude product: H-Cube®: 98% (purity by <sup>1</sup>H-NMR: 93%), H-Cube Pro™: >99% (purity by <sup>1</sup>H-NMR: 90%), Flow rate in all cases: 1 mL/min



## RESULTS AND CONCLUSION

Table 1. shows that the maximum concentration possible, whilst still achieving complete hydrogenation of the two nitro groups, is 0.05 M on the H-Cube® and 0.14 M on the H-Cube Pro™. This is an increase in throughput of 2.8 times. This application demonstrates the increase in productivity that can be achieved by using the expanded hydrogen production capabilities of the H-Cube Pro™.

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