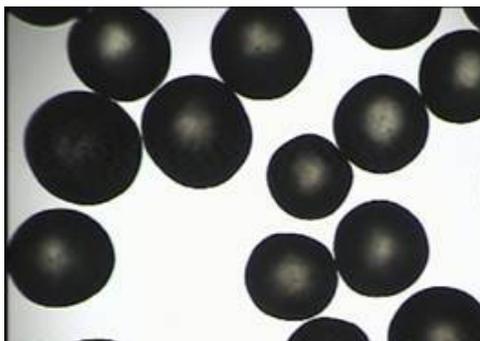


Ni EnCat™

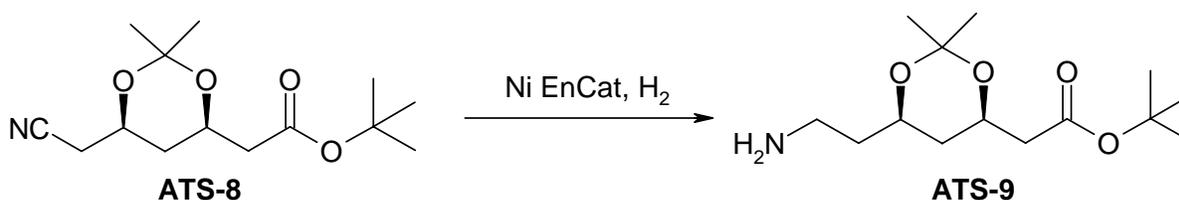
Encapsulated Ni(0) catalysts - *beta test samples*

Samples of Reaxa's Nickel EnCat™ catalysts are now available for user testing



Cleaner products	reduced Ni and Al contamination versus other nickel catalysts
Cleaner waste streams	reduced metal losses in Ni EnCat™ processes
Fast, efficient processes	the EnCat™ beads filter easily
No plant contamination	metal remains trapped within the polymer bead
Improved processes	high activity and selectivity in many types of reduction reactions
Process intensification	EnCat™ can be used in batch and continuous flow processes

Application: Hydrogenation of Atorvastatin intermediates



Activated Ni EnCat (12.5 wt% Ni on substrate) gave product with > 95 % purity (by HPLC); 85 % isolated yield..

Ease of Use: Improved Safety Profile

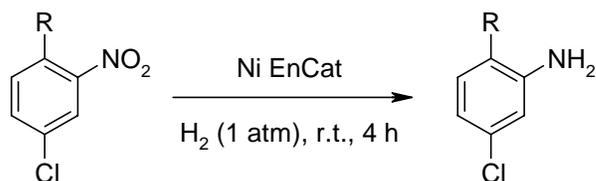
A key advantage of Ni EnCat over other sponge nickel catalyst is its reduced pyrophoricity. A sample of activated Ni EnCat was submitted to a standard pyrophoricity test (UN Pyrophoricity Test - Test N.2 method for pyrophoric solids) in which the Ni EnCat was allowed to dry out in exposure to air. No pyrophoricity or heating of the sample was detected.



Ni EnCat™

Applications

Nitro reductions



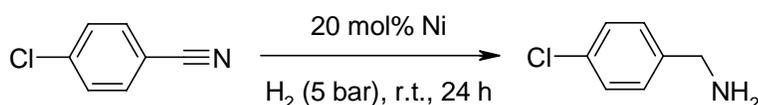
Reduced Catalyst Loading

Catalyst (mol%)	Time (mins)	% Conversion
NiEnCat™ (20)	240	100
NiEnCat™ (10)	240	100
NiEnCat™ (5)	240	100

Catalyst Recycling (5 mol%)

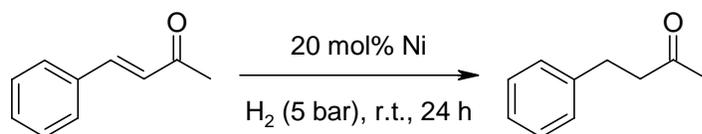
Cycle	Time (h)	% Conversion
1	16	100
2	16	100
3	16	100

Nitrile reductions



Activated Ni EnCat (0.26 g, water wet, 20 mol% Ni on substrate) was washed with MeOH three times to remove water and added to 4-chlorobenzonitrile (0.137 g, 1 mmol) dissolved in 7 N ammonia in MeOH (4 ml) in a pressure vessel. The vessel was sealed, purged twice with hydrogen then pressurised to 5 bar with hydrogen and the contents stirred at room temperature. After 24 h the hydrogen was vented and the Ni EnCat beads removed by filtration. The filtrate was concentrated on a rotary evaporator to give 4-chlorobenzylamine (0.13 g, 91 %). GCMS purity 87 %.

Alkene reductions



Activated Ni EnCat (0.26 g, water wet, 20 mol% Ni on substrate) was washed with MeOH three times to remove water and added to benzalacetone (0.148 g, 1 mmol) dissolved in MeOH (4 ml) in a pressure vessel. The vessel was sealed and purged twice with hydrogen then pressurised to 5 – 6 bar with hydrogen and the contents stirred at room temperature. After 24 h the hydrogen was vented and the Ni EnCat beads removed by filtration. The filtrate was concentrated on a rotary evaporator to give 4-phenylbutanone (0.149 g, 99 %). GCMS purity 88 %.

Nickel EnCat™ samples can be provided for customer trials with up to 20% by weight nickel content and have a typical bead size of between 150 and 350 microns.

Feedback from these initial customer trials will be used to optimise the EnCat™ properties, such as metal loading, polymer pore size and nickel catalyst activity, in preparation for commercial launch of the Ni EnCat™ products later in the year.

