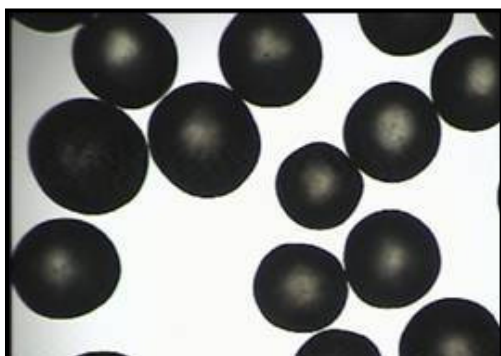


# Ni EnCat™



## Encapsulated Ni(0) catalyst

Non-pyrophoric, reusable catalyst for hydrogenations



Reaxa's Ni EnCat™ is the latest addition to the Company's range of hydrogenation catalysts, aimed to provide cleaner, faster and more efficient processes.

Samples are available for clients to evaluate the catalyst in their processes and additionally EnCat™ properties can be optimised for specific applications.

### Advantages of Ni EnCat™

**Cleaner products** reduced Ni and Al contamination versus other nickel catalysts

**Cleaner waste streams** reduced metal losses in Ni EnCat™ processes

**Safer** No evidence of pyrophoricity - passes UN Test N.2 (see below)

**Fast, efficient processes** EnCat™ beads filter very easily reducing process time

**Reusable** EnCat™ beads can be easily filtered and reused

**No plant contamination** metal remains trapped within the polymer bead

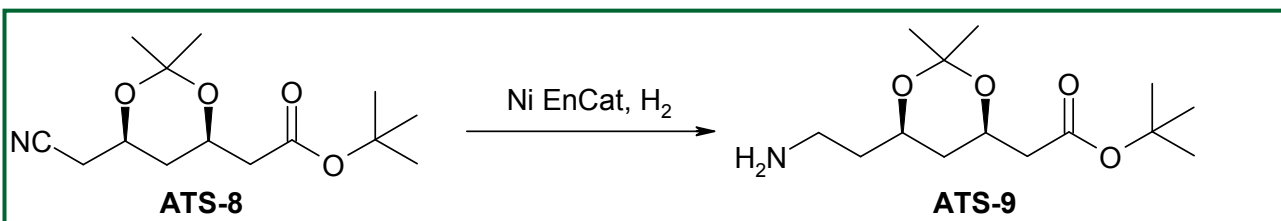
**Improved processes** high activity and selectivity in many types of reduction reactions

**Process intensification** EnCat™ can be used in batch and continuous flow processes

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.

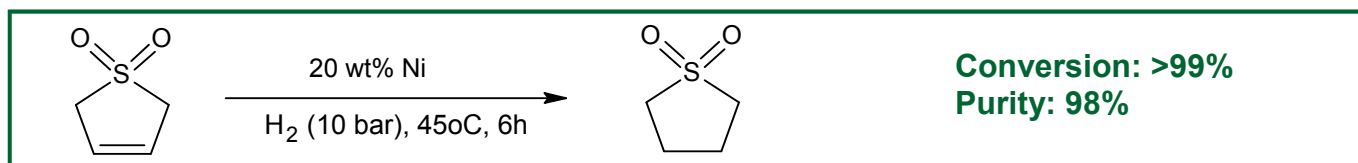
**No pyrophoricity or heating of the sample was detected.**

### Application: Hydrogenation of Atorvastatin intermediates



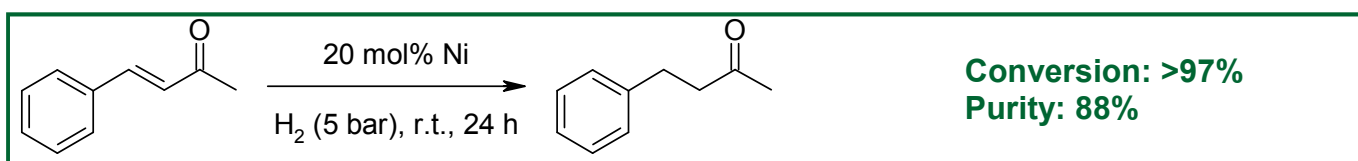
The process was carried out using activated Ni EnCat (20 wt% Ni on substrate)  
The product was isolated (99% yield) with >95 % purity (by HPLC)

## Applications: Stability to Sulfur containing substrates



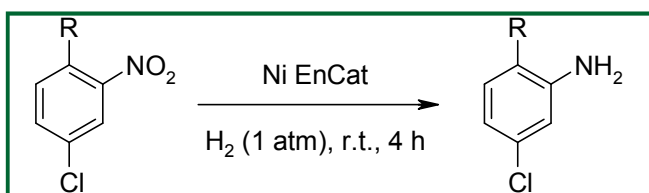
Activated Ni EnCat (0.95 g, water wet, 20 wt% Ni on substrate) was washed with MeOH three times to remove water and added to 3-sulfolene (0.47 g, 4 mmol) dissolved in MeOH (4 ml) in a pressure vessel. The vessel was sealed, purged twice with hydrogen then pressurised to 10 bar with hydrogen and the contents stirred at 45°C. After 6 h the hydrogen was vented and the Ni EnCat beads removed by filtration. The filtrate was concentrated on a rotary evaporator to give sulfolane (0.48 g, 99 %). GCMS purity 98 %.

## Applications: 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 %.

## Applications: Nitro reductions demonstrating reduced catalyst loading and reuse



Reactions were carried out using activated Ni EnCat at room temperature and pressure. Catalyst was reused by filtering only with no further activation steps necessary. Conversion was measured by HPLC.

NiEnCat (mol%)	20	10	5
Reaction Time (mins)	240	240	240
Conversion (%)	>99	>99	>99

Cycle (5 mol% NiEnCat)	1	2	3
Reaction Time (mins)	240	240	240
Conversion (%)	>99	>99	>98

Nickel EnCat™ samples can be provided for customer trials with up to 30% by weight nickel content and have a typical bead size of between 150 and 350 microns.

Optimisation of EnCat™ properties, such as metal loading, polymer pore size and incorporation of metal dopants can be provided as additional products for specific applications.

Please contact [info@reaxa.com](mailto:info@reaxa.com) to discuss your nickel catalyst project and obtain Nickel EnCat™ samples