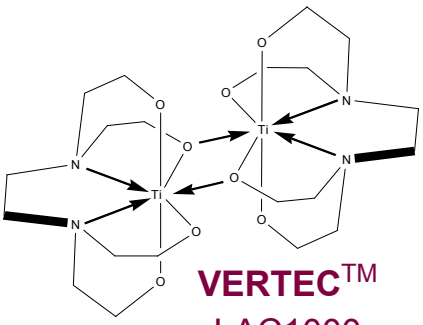
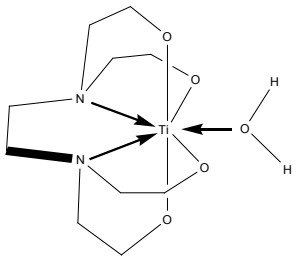
VERTEC™ LAC -
Water Tolerant Selective Oxidation Catalysts

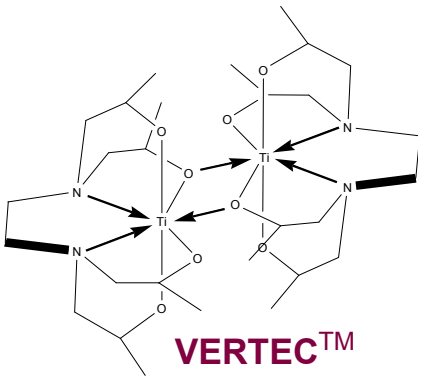
Alfa Aesar is pleased to offer the new VERTEC™ LAC range of homogeneous water and methanol tolerant titanium(IV) Lewis acid catalysts. VERTEC LAC offers a performance level above and beyond that of traditional titanium alkoxide catalysts since VERTEC LAC products are immune from deactivating catalyst hydrolysis and methanolysis issues.



VERTEC™ LAC1000



VERTEC™ LAC1500



VERTEC™ LAC2000

A common feature of other titanium(IV) alkoxide catalysts is their high reactivity with water and methanol, due to their d^0 configuration and thus highly oxophilic nature. In the presence of water or methanol, hydroxide or methoxide groups replace other ligands, followed by the formation of bridged polynuclear aggregates, with the final thermodynamic product being catalytically inert titanium dioxide or titanium methoxide.

The new VERTEC LAC catalyst range offers the following benefits:

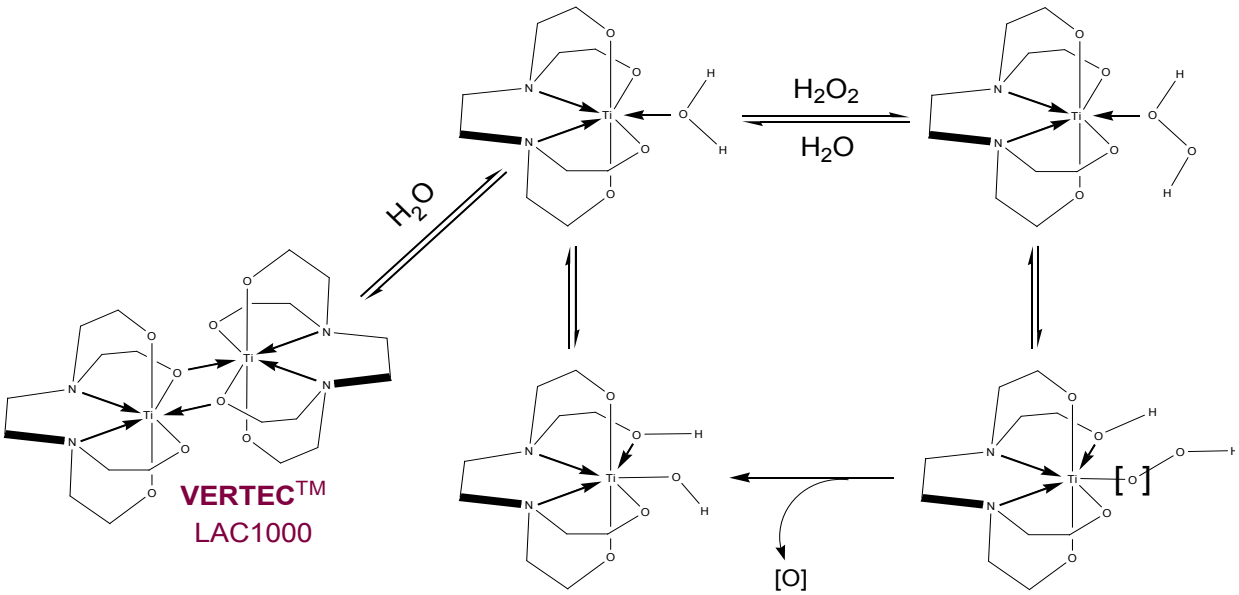
- Easier handling, both for industrial applications as well as for small-scale laboratory work.
- Ideal for condensation reactions where catalyst deactivating water or methanol is produced.
- Inexpensive and non-toxic aqueous hydrogen peroxide can be used as primary oxidant, yielding water as the only side product.
- Water as reaction solvent adds value from a cost and environmental viewpoint.
- High catalytic activity and selectivity at room temperature.
- Stoichiometric ratios of reagents can be used, reducing waste and costs.
- Catalyst loading down to 0.1%, while still obtaining quantitative yields.
- Recycling of the aqueous catalyst solution without loss of activity.
- Single site catalyst greatly facilitates mechanistic studies and optimization.

VERTEC LAC Products

H31066	VERTEC™ LAC1000
H30332	VERTEC™ LAC1500, 50% w/w aq. soln.
H31123	VERTEC™ LAC2000

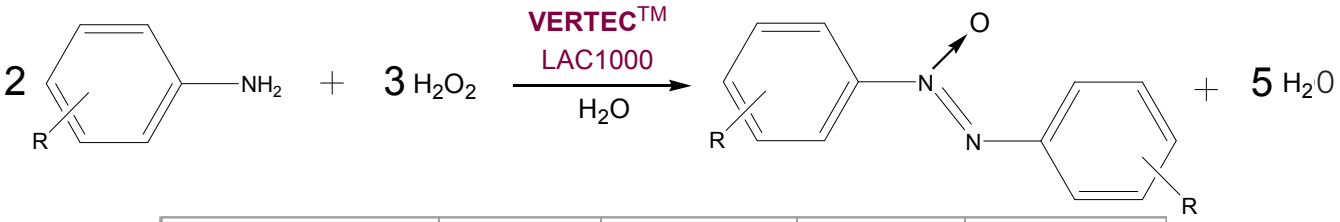
VERTEC™ LAC -
Water Tolerant Selective Oxidation Catalysts

The VERTEC Lac range generates a highly active and selective titanium hydroperoxo complex (Ti-OOH) in the presence of hydrogen peroxide, even in aqueous solution. Single site catalyst greatly facilitates mechanistic studies and optimization.



Synthesis of Azoxy Arenes Using H_2O_2

The simplicity of this high yielding method and the use of water and ethyl acetate as environmentally friendly solvents in the reaction and work-up procedures, respectively, highlight the effectiveness of this methodology.



VERTEC™ LAC1000 Catalyst Loading (%)*	Reaction Time (hrs)	Azoxybenzene Yield (%)	Unreacted Aniline (%)	Side Products** (%)
1	2	92.7	4.6	2.7
0.2	24	96.6	0	3.4

Reactions were run at 20-25 °C using aniline (500 mg, 5.38 mmol) and H_2O_2 (35% in water, 840 mg, 8.65 mmol) in water (50 ml). The reaction products were extracted using ethyl acetate and all reaction products identified using GCMS-EI+ analysis and quantified using GC-FID analysis.

* Catalyst loading based on mole % Ti(IV)/aniline.

** Side products = azobenzene, nitrosobenzene and nitrobenzene.