

Biomass Chemicals: A true low temperature olefins-from-alcohols process



SiGNa Chemistry has created a new AIPO-based catalyst that efficiently converts alcohols to olefins — such as ethanol to ethylene and propanol to propylene — with no poisons or impurities. This catalyst allows for olefin production below 150 °C with higher yield and selectivity at a low cost.

Background

Ethylene and propylene are two of the largest produced organic chemicals in the world, with more than 150 MMTs being produced every year. Both olefins are essential to the production of many of the everyday petrochemical products used in modern society. Limited supply, changes in global policy, and “green” pull from consumer product retailers are driving demand for these raw materials to be produced from renewable bio-based starting materials.

Current Commercial Drawbacks

Current alcohol to olefin conversion is carried out using either corrosive liquid acids or mild solid-acid catalysts. Both processes have their challenges:

- High Temp (> 425 °C)
- Low Pressure (1 bar)
- Expensive Construction
- High Maintenance Recurrence
- Lower Olefin Recovery
- Large Purification Need
- Capital Intensive Recycle

SiGNa's AIPO Solution

All of the challenges associated with mild solid-acid catalysts have inspired many attempts to develop a true low cost, low temperature catalyst and process alternative. All of these efforts have failed, until now. SiGNa's new AIPO-based catalyst is an innovative solution to converting alcohols into olefins. SiGNa's catalyst allows for the most low energy and eco-friendly processing with no other catalyst matching its acid strength and shape selectivity.

The SiGNa AIPO Advantage

The SiGNa AIPO process offers unique advantages with over **30% savings** in operation and CapEx:

- Liquid Phase Processing (< 150 °C)
- Higher Olefin Yield and Selectivity
- Reduced Adiabatic Temperature Drop
- Continuous Olefin Generation at High Pressures
- No Space Velocity Limitations
- Limited Coke Formation
- Extended Catalyst Reactor Lifetime
- Cheap Construction Materials
- Easily Regenerated Catalyst

SiGNa AIPO Catalyst Comparison with Other Ethanol to Ethylene Solutions

Parameter	Aluminosilicate	ZSM-5	SiGNa AIPO
Base Condition	EtOH (5-10% H ₂ O)	EtOH (5-10% H ₂ O)	EtOH (5-10% H ₂ O)
Operating Temperature	> 425 °C (gas phase)	550 °C (gas phase)	< 150 °C (liquid phase)
Product Yield	94-96%	91-94%	95-98%
Product Selectivity	96-98%	94-96%	99+%
Product Pressure	1 bar	1 bar	up to 30 bar
Cost per lb. (Op and CapEx)	15% of Base	Base	45% of Base
Equipment Maintenance	High	High	Much lower
Corrosion Problems	Yes	Yes	None