

## Catalyst performance testing: the influence of catalyst bed dilution on the conversion observed

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### Abstract

A study was performed to investigate the influence of inert dilution on the conversion in a gas-solid laboratory micro-reactor for an irreversible reaction, viz. the catalyzed N<sub>2</sub>O decomposition over two different catalysts: FeZSM-5 and Co-La, Al mixed oxide. Vertically and horizontally segregated beds, as well as mixed beds with different degrees of dilution were considered. The results showed that catalyst dilution should be applied with caution since it may significantly influence the conversion and lead to an erroneous interpretation of data from catalyst activity measurements and kinetic studies. If the catalyst and the diluting particles are not well-mixed, the conversion reduces significantly due to bypassing and axial dispersion. Also apparent activation energies are reduced. The effects are stronger at high conversion levels (> 0.4).

Also over beds in which the catalyst and the diluent are perfectly mixed the conversion may be negatively affected by the dilution. It was found that the relative deviation in conversion caused by the dilution can be well estimated from observable parameters, i.e. the observed conversion, the volume fraction of bed dilution, the bed height, and the particle diameter. The relative deviation is approximately proportional to the reaction order. The combination of a high degree of dilution and high conversion should be avoided in catalyst activity measurements.

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*Keywords:* Catalyst testing; Bed dilution; Radial Dispersion; Axial Dispersion, Laboratory reactor; Kinetics; Modeling; Simulation; N<sub>2</sub>O decomposition; Apparent Activation Energy.

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