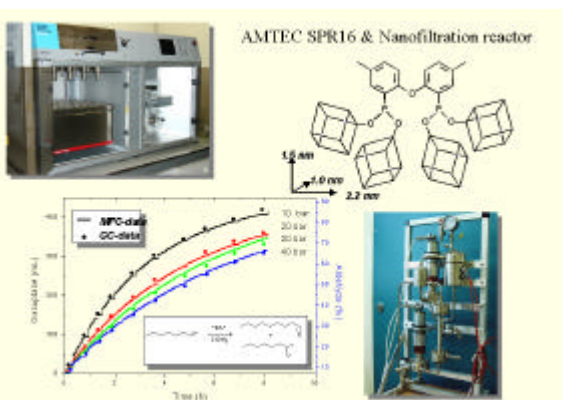


World markets for catalysts (The Catalyst Group Inc.)



AMTEC SPR16 automated, parallel slurry phase reactors (250 °C, 150 bar), typical Hydroformylation experiment; Proprietary Membrane loop reactor.



South Mississippi POSS production (Hybrid Plastics Inc.)

Selected Patents

Calcined petroleum refining catalysts with small dispersed metal particles prepared from metal silsesquioxane catalyst precursors. H.C.L. Abbenhuis *et al.*; PCT Int. Appl. (2003), WO 2003082465.

Catalysts based on polymers bearing silsesquioxane metal complexes. H.C.L. Abbenhuis *et al.*; Eur. Pat. Appl. (2002), EP 1213053.

Metal complex containing one or more silsesquioxane ligands, silsesquioxane compound, and catalyst preparation for olefin polymerization. H.C.L. Abbenhuis *et al.*; Eur. Pat. Appl. (1999), EP 967229.

More science from us

The dynamic status quo of polyhedral silsesquioxane coordination chemistry. European Journal of Inorganic Chemistry (2004), (4), 675-683.

Versatile phosphite ligands based on silsesquioxane backbones. Advanced Synthesis & Catalysis (2004), 346(4), 399-412.

Synthesis and characterisation of microporous bimetallic Fe-Cr-Si-O materials derived from silsesquioxane precursors. Journal of Materials Chemistry (2002), 12(12), 3792-3798.

Titanium silsesquioxanes grafted on three-dimensionally netted polysiloxanes: catalytic ensembles for epoxidation of alkenes with aqueous hydrogen peroxide. Angewandte Chemie (2002), 41(4), 637-639.

Advances in homogeneous and heterogeneous catalysis with metal-containing silsesquioxanes. Chemistry--A European Journal (2000), 6(1), 25-32.



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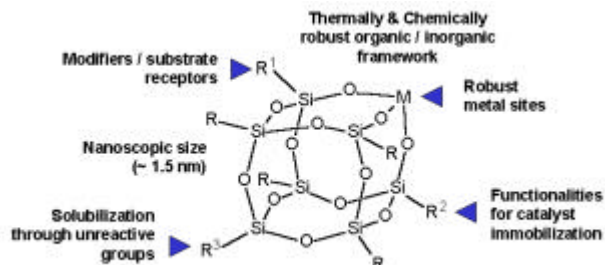


POSS® Nanostructured® materials and metallates. Test panel setup during Nasa's 2001 Materials International Space Station Experiment.



POSS[®] Nanostructured[®] Catalyst Technology

Catalysts are derived from chemicals known as polyhedral oligomeric silsesquioxanes rendering POSS[®] metal derivatives. POSS[®] catalysts have unique features:



- The chemical composition of the support is a hybrid, intermediate (RSiO_{1.5}) between that of silica (SiO₂) and silicones (R₂SiO). The support is electron withdrawing and increases Lewis acidic catalyst activity.
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- POSS[®] catalysts are physically large and range approximately 1-3nm in size. They can be molecularly enlarged (POSS[®] building block chemistry) to cover applications from homogeneous catalysis via membrane catalyst retention to truly heterogeneous catalysis, either in gas or liquid phase application.

Systematic Chemistry

POSS[®] Nanostructured[®] Catalysts exemplify a chemical nanotechnology. The precise size of cage, composition and metal incorporation is defined by exact formula weights and molecular representations. Reproducibility and quality of catalyst synthesis are assured through the precise nature of POSS[®]. Well-defined POSS[®] metal libraries illustrate the potentially wide window for POSS[®] Nanostructured[®] Catalyst applications.

POSS metal / element available																					
H	He	[POSS metal / element available]														Ne					
Li	Be	[POSS metal / element available]														B	C	N	O	F	Ne
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr				
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe				
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn				
Fr	Ra	Ac	[POSS metal / element available]														Ra				
[POSS metal / element available]																					
[POSS metal / element available]																					

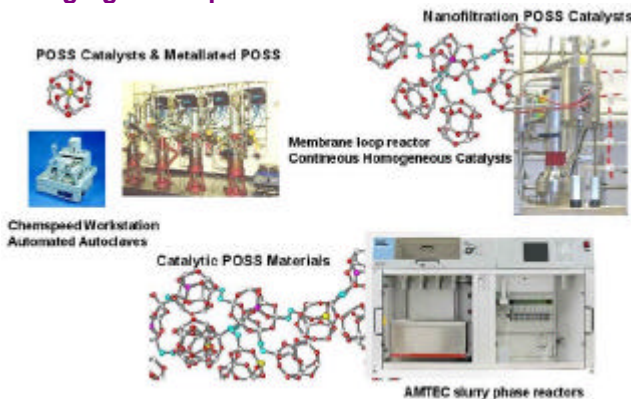
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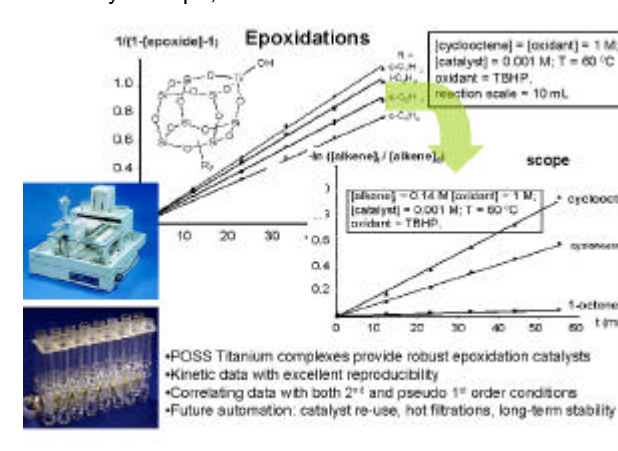
Bridging the Gaps



POSS[®] Nanostructured[®] Catalysts and Technologies bridge the gap between homogeneous and heterogeneous catalysis. Experience gained with heterogeneous catalysts can now be translated to homogeneous application and *vice versa*. Suitable methodologies are available for catalyst heterogenization involving physisorption, grafting or the synthesis of microporous supported catalysts using POSS[®] Metal Precursors.

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 Kinetic data with excellent reproducibility
 Correlating data with both 2nd and pseudo 1st order conditions
 Future automation: catalyst re-use, hot filtrations, long-term stability

Affordable Nanotechnology

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