



# THE DOW CHEMICAL COMPANY: CORPORATE R&D INNOVATION

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# Materials Science Division: Industry's Premier Materials Solutions Provider

2016 Net Sales: ~\$40B, >20% Op. EBITDA Margin\*

## TECHNOLOGY PLATFORMS

- Polyolefins
- Elastomers
- Polyurethanes
- Silicones
- Acrylics
- Ethylene oxide derivatives
- Propylene oxide derivatives
- Cellulosics



### Packaging & Specialty Plastics

~\$20B  
Net Sales  
>25%  
Op. EBITDA  
MARGIN



### Industrial Intermediates & Infrastructure

~\$11B  
Net Sales  
>15%  
Op. EBITDA  
MARGIN



### Performance Materials & Coatings

~\$8B  
Net Sales  
~15%  
Op. EBITDA  
MARGIN

## WORLD-CLASS CAPABILITIES

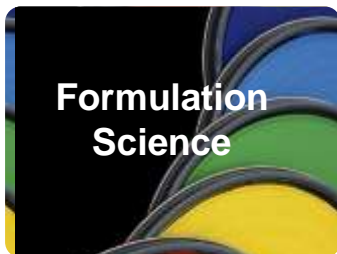
- High-throughput R&D
- Catalyst discovery
- Polymer science
- Formulation expertise
- Process engineering
- High-performance computer modeling
- Application development

- Integration across assets, technologies and end-markets
- Strongest and deepest chemistry toolkit in the industry, with scale
- Higher asset intensity, greater vertical integration, industry-leading market verticals



\*Includes silicones net sales and EBITDA for FY16. Operating EBITDA is defined as income from continuing operations, net of tax excluding depreciation and amortization, interest income, interest expense and amortization of debt discount, taxes, and significant items

# Corporate R&D Feeds Business *Innovation* Pipelines



Controlled architecture synthesis  
Polymer modification  
Novel polymer additives

Electronic structure methods  
Molecular dynamics  
Structure activity relationships

POLYMER CHEMISTRY

COMPUTATIONAL CHEMISTRY

Structure property relationships  
Ligand design and synthesis  
High-throughput screening

*Skillsets & capabilities combine to accelerate innovation*

ORGANOMETALLIC CHEMISTRY

PROCESS CHEMISTRY

Atom economy  
Route optimization  
Scale-up trouble-shooting

PHYSICAL CHEMISTRY

Reaction kinetics  
Reaction thermodynamics  
Phase behavior analysis

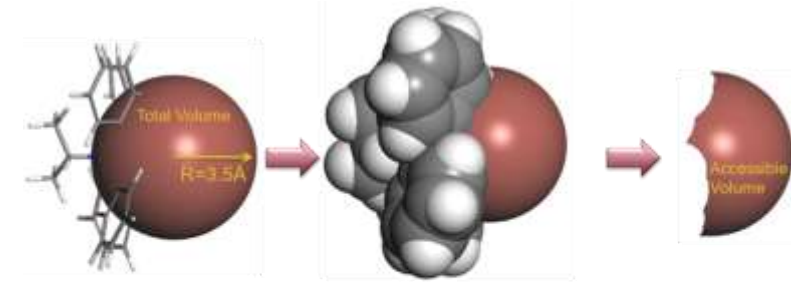
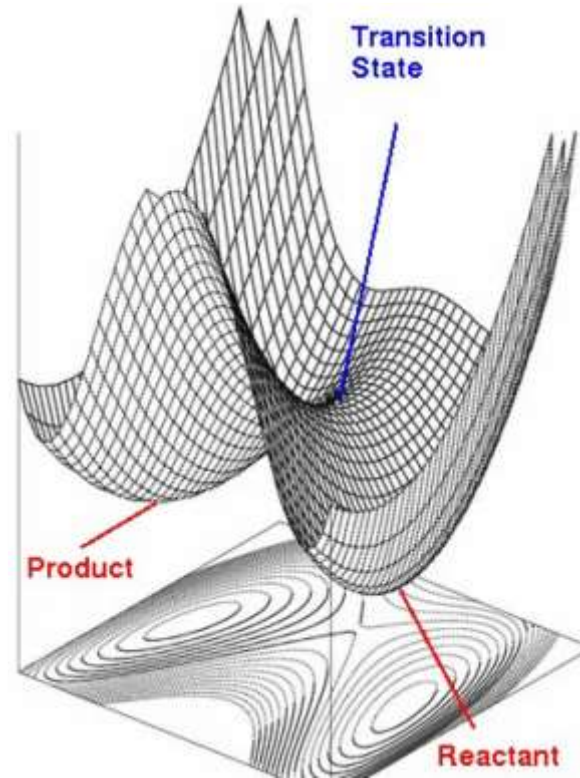
ORGANIC SYNTHESIS

High-throughput enabled  
Catalytic coupling chemistries  
Protecting group chemistries

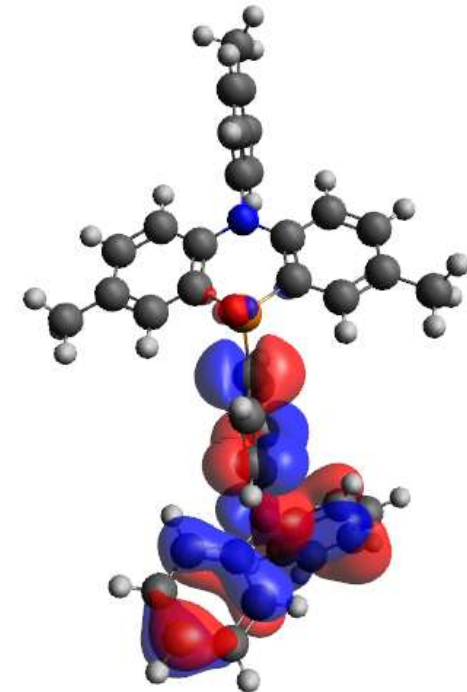
# Designing Materials and Understanding *Structure - Function*

Methods: Density Functional Theory, Post-Hartree Fock Methods & Molecular Dynamics

- Kinetics / Thermodynamics
- Transition state energies
- *Potential Energy Surfaces*
- Bond energies
- Selectivity
- *Molecular structure*
- Molecular dynamics
- Gas phase and Condensed phase quantum chemistry
- Frontier Orbitals
- DFT calculations
- Acid-base/Solvation



$$AccVol = \frac{Accessible\ Volume}{Total\ Volume}$$



***How can we incorporate quantum computing approaches to accelerate structure – function discovery research?***