



# NANOSURFACES

## Do your students understand how surface structure can change surface properties?

Nature has developed many methods for creating effective surfaces. Students discover that physical as well as chemical properties of surfaces can affect surface behavior such as wetting, friction, and durability. They also learn how different techniques, both natural and man-made, modify those properties. In the design projects they use this knowledge to design a surface modification of their own, testing it for the attributes they wish to improve.

By incorporating everyday materials into science lessons, the Materials World Modules (MWM) program at Northwestern University has found a solution to getting students excited about learning science while helping teachers meet national and state education standards.

The modules are easy to organize and inexpensive to use. They can be incorporated into any science class because of the breadth of subjects covered in the Activity and Design Project sections. Each module is a supplemental science unit that takes 1-3 weeks of class time (approximately 10 hours) to complete.

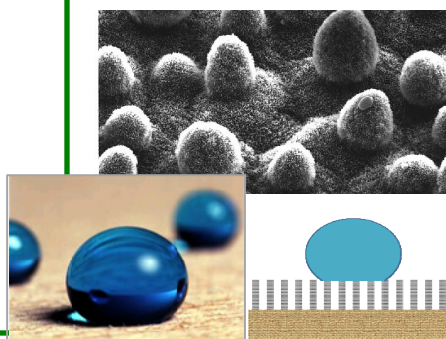
### Module At-a-Glance:

#### Activities

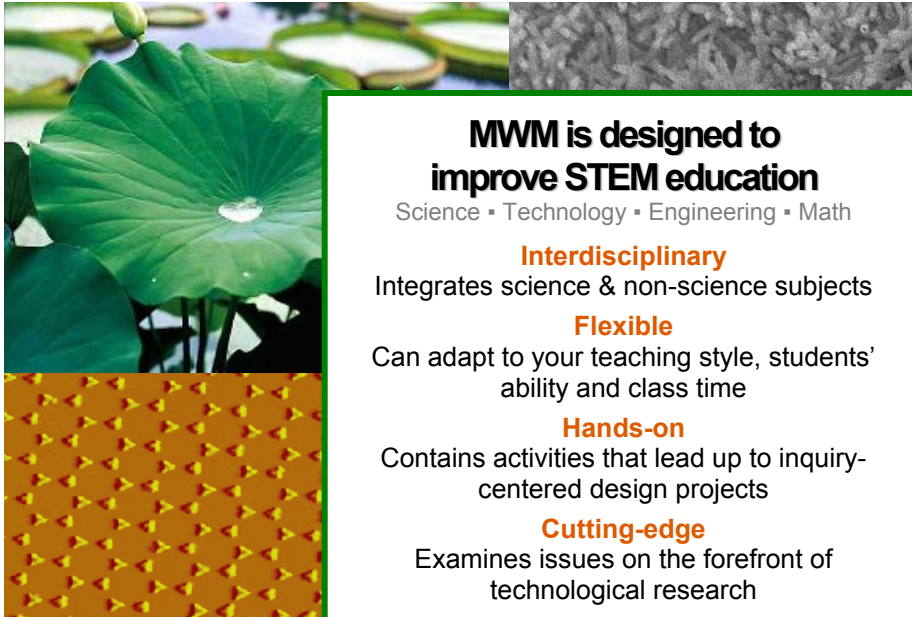
- Tour of Surface Properties
- Searching for Nanosurfaces
- Testing for Hydrophobicity
- Measuring Friction
- Structured Surfaces

#### Design Project

- Designing a Modified Surface



MWM will give students an opportunity to understand the world around them in a way they have never experienced before. The modules promote an awareness of the roles science and technology play in society and guide students to take increased control of their work.



**MWM is designed to improve STEM education**

Science • Technology • Engineering • Math

**Interdisciplinary**  
Integrates science & non-science subjects

**Flexible**  
Can adapt to your teaching style, students' ability and class time

**Hands-on**  
Contains activities that lead up to inquiry-centered design projects

**Cutting-edge**  
Examines issues on the forefront of technological research

## Materials World Modules

An Inquiry & Design Based STEM Education Program  
Northwestern University ■ [www.materialsworldmodules.org](http://www.materialsworldmodules.org)  
847-467-0994 ■ [mwm@northwestern.edu](mailto:mwm@northwestern.edu)



Connects  
to Your  
Curriculum

### Chemistry

- Attractive Forces ■ Colors and Light ■ Physical and Chemical Properties ■ Atom Arrangements in Solids ■ Atomic Packing ■ Hydrogen Bonding ■ Van der Waals Forces ■ Surface Structure ■ Vibration of Molecules ■ Hydrophobic/Hydrophilic

### Biology & Life Sciences

- Capillary Forces ■ Hydrophilic/Hydrophobic Reactions ■ Biomimetics

### Mathematics

- Orders of Magnitude ■ Measuring Angles ■ Calculating Sine and Cosine ■ Graphing ■ Using the Metric System ■ Calculating Friction Constants

### Physics & Physical Sciences

- Capillary Forces ■ Friction ■ Electrostatics ■ Measuring Forces ■ Colors and Light

### Society

- Ethics and Impact of Uses of Nanotechnology

### Language Arts

- Public Speaking ■ Word Derivations ■ Writing a Scientific Paper