Faculty, by name
Faculty, by discipline
Faculty, Emeriti
Visiting Faculty
Teaching Staff
Publications
Open Positions

View | Publications

Van-Vliet

Krystyn J. Van Vliet

Professor of Materials Science and Engineering

ScB, Materials Engineering, Brown University, 1998

PhD, Materials Engineering, MIT, 2002

8-237

Phone:

(617) 253-3315
krystyn@mit.edu
Van Vliet Group

Disciplines:

- Biophysics
- Biotechnology
- Composites
- Computational Materials Science
- Mechanical Behavior of Materials
- Metallurgy
- Nanotechnology
- Polymers
- Structural and Environmental Materials
- Surfaces
- Thin Films

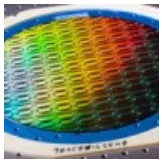
Research:

Professor Van Vliet's group studies material chemomechanics: material behavior at the interface of mechanics, chemistry, physics, and biology. She focuses on thermodynamically metastable surfaces and interfaces, in which stress-assisted chemical reaction kinetics are notoriously difficult to analyze via either experiment or simulation. The mechanisms of this coupling in cell-material interactions are incompletely understood, due to both biological complexity and lack of appropriate experimental and computational tools, but are key to design of materials that modulate cell adhesion for

drug uptake and differentiation. Her long-term goal is to predict and modulate key functions of biological cells by drawing analogies to the coupled chemical/mechanical behavior of structurally simpler, nonbiological material interfaces and nanocomposites. These integrated experimental and computational efforts include three main thrusts: (1) chemomechanical mapping of nanocomposite surfaces including living cells; (2) mechanics of amorphous and viscoelastic surfaces and nanostructures; and (3) chemical kinetics in mechanically strained, nanoscale material interfaces. Her group has used this interdisciplinary application of mechanical and chemical forces to rapidly map environment-structure-property relations in engineered materials, and to predict the binding kinetics of individual molecules on living cells. These studies have shown that the stiffness of materials to which molecular ligands are tethered can directly affect kinetics of ligand-receptor interactions at cell surfaces.

Professor Van Vliet serves as the faculty supervisor of the DMSE Nanomechanical Technology Laboratory, has co-developed new undergraduate core classes, and has implemented new programs to retain underrepresented minority students.

Related News:



Consortium including MIT awarded $110M national grant to promote photonics manufacturing

Tuesday, July 28, 2015 - 5:30pm

A new partnership of government, industry, and academia will pursue integration of optical devices with electronics. MIT is a key player in a new $600 million public-private partnership announced today by the Obama administration...

Faculty Highlight: Krystyn Van Vliet

Thursday, March 19, 2015 - 8:00pm

With joint appointments in the departments of Materials Science and Engineering and Biological Engineering, MIT Associate Professor Krystyn J...

New technique allows scientists to identify populations of rare stem cells in bone marrow

Tuesday, October 7, 2014 - 8:00pm

In a new study that should make it easier to develop such stem-cell-based therapies, a team of researchers from MIT and the Singapore-MIT Alliance in Research and Technology (SMART) has identified three physical characteristics of MSCs that can distinguish them from other immature cells found in...

Stronger and Greener Cement

Wednesday, September 24, 2014 - 8:00pm

Analysis of material's molecular structure leads to a new formula that could cut greenhouse-gas emissions. See the MIT News Office for the story.

Probing the surface of pyrite

Tuesday, October 8, 2013 - 8:00pm

Common mineral gets first detailed examination of its surface electronic properties, thanks to team of MIT researchers. See the MIT News Office for the full story.

...

MIT News Office profiles Prof. Van Vliet

Tuesday, November 1, 2011 - 8:00pm

Exploring the inner workings of materials: From concrete to cancer cells, Van Vliet brings an engineer’s mindset to the study of biology and materials.

...

Prof. Krystyn Van Vliet and Chemomechanical Interactions at the Nanoscale

Tuesday, September 20, 2011 - 8:00pm

A new approach to scratch resistance

Tuesday, August 16, 2011 - 8:00pm

Analysis by Meng Qu, a postdoc in MIT's Department of Materials Science and Engineering, Prof. Krystyn Van Vliet, and several researchers at DuPont Nanocomposite Technologies in Delaware could lead to improved coatings using polymer-based nanocomposite materials. Learn more from the...

Ellen Swallow Richards, MIT's first alumna, was the wife of Robert H. Richards, the first head of Course III.