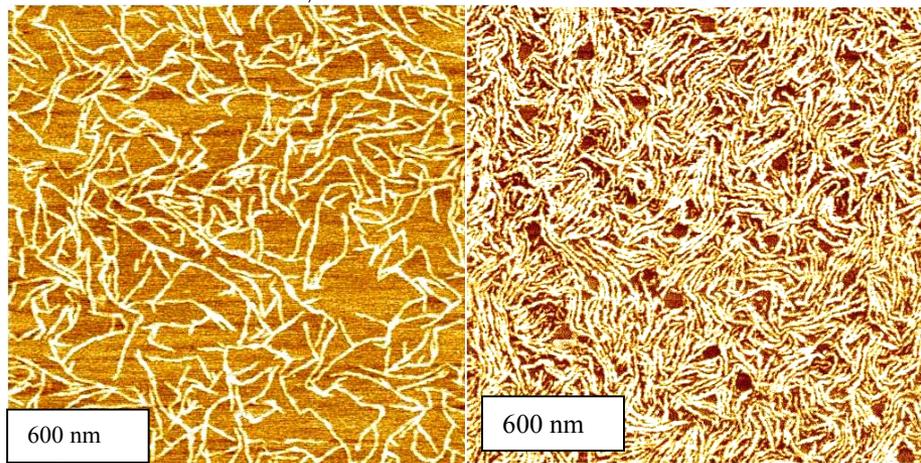
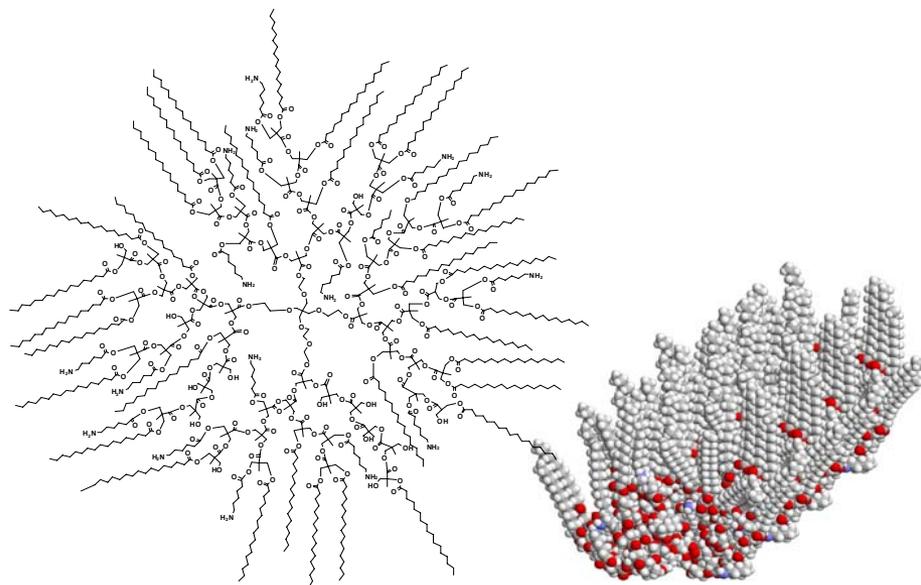


# DMR-0308982, Assembling dendritic and branched molecules at interfaces

Vladimir Tsukruk, Iowa State University

## Major Research Accomplishment, 2003-2004

We design a highly branched molecules with balanced composition of alkyl tails, amine and carboxylic groups “built-in” in core-shell design and observed stable and uniform nanofibrillar structures on silicon surfaces. Our finding shows a critical role of a highly branched, dendritic chemical architecture with *multiple specific intermolecular interactions* in the assembling of organized supramolecular structures. This result extends the known concept of steric balances and intermolecular interactions beyond well-defined shape-persistent molecules and to flexible, polydisperse, and branched molecules.



*J. Am. Chem. Soc.*, 2004, 126, 9675-9684  
*Angew. Chemie*, September 2004

Chemical formula of functionalized branched molecule and a molecular model of a semi-cylindrical micelle (top); AFM images of molecular nanofibrills for LB monolayer in low and high density states (bottom).

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## Impact, 2003-2004

### • Educational impact:

**D. Julthongpiput** graduated in summer 2003 and received All-University **Graduate Research Excellence Award** for the **best PhD work** at Materials Science & Engineering Department. Currently, she is a post-doctoral researcher at Polymer Division, NIST. **K. Genson** received a MS degree and continues her PhD studies.

**M. Lemieux**, is on an internship at Lawrence Livermore National Lab.

**K. Bergman**, an undergraduate student, received Intel summer internship to work at Intel Research Center, CA on ultrathin polymer films (Summer 2004)

### Collaboration with research labs in USA, Germany, Ukraine, Japan, and Korea:

**materials supplied by:** D. McGrath (U. Arizona), M. Lee (Yonsei U., Korea), V. Shevchenko who is a visiting scientists in summer 2004 (National Acad. Sci., Ukraine), E. Zubarev (ISU); **characterization:** D. Vaknin (Ames Lab), M. Stamm (Inst. Polymer Research, Dresden), A. Takahara (Kyushu U); synchrotron studies at Argonne National Lab are supported by DOE.

- **Outreach:** Students delivered **12 presentations** (eight oral and four posters) at ACS National Meetings in NY, Anaheim, and Philadelphia; two female high-school students participated in summer 2004 research in the PI lab within **Program for Women in Science and Engineering** (see picture of K. Genson with students)

