

UNH Materials Science Seminar

11:00-12:00, Thursday, April 7, 2005
DeMeritt Hall 209B, University of New Hampshire

Sensor Materials and Microfabricated Instruments

Professor Rosemary L. Smith
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The Laboratory for Surface Science and Technology (LASST) is an interdisciplinary research unit at the University of Maine, comprising faculty, research staff, students and post-doctoral associates from five disciplines. The overarching theme is advanced materials, spanning the spectrum from basic science to applied technology with applications to microelectronics, sensors, nanotechnology, biotechnology and instrumentation. An established, and very active effort is in the area of sensor materials, particularly metal oxide films for gas sensing. Two sensor platforms have been established that utilize these films: surface acoustic wave sensors and conductivity sensors. Microfabricated instruments and systems is a new addition to LASST, including silicon-based microsensors, microfluidics, microinstruments, and MEMS. In particular, a new focus on biological applications has emerged. In this presentation, a brief overview of LASST will be given, followed by examples of biosensor and microinstrument research. This work requires an integrated effort in basic materials science, technology development, and systems engineering. One microinstrument in particular will be described in detail, which integrates biochemically functionalized nanoparticles with microfluidics, microneedles, and electronics to detect target biomolecules within 100 nL

of interstitial fluid, extracted painlessly from just beneath a human subject's skin. This project requires expertise from many disciplines, including medicine, electrical engineering, chemical engineering, chemistry, biomedical engineering, and materials science. The science and engineering challenges faced and met, as well as those that remain will be discussed.

Professor Smith received her Ph.D. in Bioengineering from the University of Utah in 1982. Her research focus is the application of microtechnology to biomedical sensors and instruments. After two years as Assistant Professor at Drexel University, she worked at the Swiss Center for Microelectronics as a Visiting Scientist, followed by two years at MIT as Sinclair Visiting Assistant Professor. From 1988 to 2003, she was a member of the faculty of the University of California at Davis, where she established an active research program in microsensors and bioMEMS. She has recently joined the faculty of the University of Maine, where she is co-director of the Microinstruments and Systems Laboratory and a member of the Laboratory for Surface Science and Technology. She has authored or co-authored over 120 refereed journal articles and conference papers on microsensors, microinstruments and microtechnology. Her current research activities include microneedle arrays for biosample extraction, delivery and measurement, and microfluidic instruments for biomolecular analysis.