FLEXIBLE ELECTRONICS

Session co-chairs: Lynn Loo, Princeton University, and Tina Ng, Palo Alto Research Center

One of the research frontiers in electronics is to transform conventional fabrication processes to meet the demands of soft, pliant, and often easily damaged surfaces. Research in new materials and patterning technologies has enabled flexible electronics that push the boundaries of how electronics are made and used, to potentially incorporate electronic control and power sources into any object. Unlike conventional silicon electronics that are limited to rigid wafers, flexible electronic devices have been demonstrated on plastics, paper, fibers, and even biological tissues. These flexible devices enable a wide range of applications, impacting fields ranging from energy sustainability, smart sensor networks, to bio-electronics. Some specific examples include energy-efficient, stretchable lighting, lightweight photovoltaics, smart-sensing wallpaper, and dissolvable electronic implants.

To make flexible electronics that are compatible with delicate surfaces, low temperature processing is required. This mandate has led to development of materials, such as organic conductors and semiconductors, as well as advanced solution-based techniques that enable low-temperature processing. Thus, flexible electronics not only enable novel applications but also promote the use of alternative manufacturing technologies, such as roll-to-roll printing for electronics. Since the materials, fabrication process, and applications are inter-related, the speakers will touch on all three aspects to provide a comprehensive overview of this rich and exciting field of flexible electronics.

The first speaker Dr. Antonio Facchetti will speak to the materials development that have enabled the fabrication of opto-electronic devices, such as displays, circuits, and solar modules, on unconventional substrates, such as flexible foils. He will demonstrate the materials design and processing strategies that have greatly advanced the performance of printable organic devices.

The second speaker Dr. Nanshu Lu will discuss the fabrication and bio-integration of tissue-like electronics that can conform to and deform with living organisms for physiological sensing and stimulation. She will explain to the audience the mechanics of thin films, micro-fabrication, and bio-integration of stretchable electronics.

The third speaker, Dr. Polina Anikeeva has created a new generation of flexible electrode arrays and optoelectronic neural scaffolds that aim to minimize tissue damage and maintain high quality neural recordings over the course of several months. She will explain the potential of these devices as a platform for investigating neuronal viability and potentially facilitate repair of damaged neural tissues.