Solution-Processable Electronics

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In ambient intelligence applications, the environment is filled with sensing elements, communication elements, and display elements. All of these require solution processable electronics that can be printed cheaply on substrates like plastic, cloth, or paper. Solution-processable semiconductors often have a complicated microstructure that has been difficult to control and to understand. However, our ability to determine and control the microstructure is rapidly improving. The Institute of Solid State Physics at the TU Graz has a strong program on organic semiconductors and their use in sensors, light emitting diodes, lasers, and transistors. Roland Resel described the structure of a self-assembled layer of molecules that form the channel of a transistor. His collaborators at Philips have made integrated circuits consisting of hundreds of these transistors. In Nature Photonics, a team lead by Emil List and Joachim Krenn explained how metal nanostructures can be used to efficiently extract and manipulate light from organic light emitting diodes. The fundamental crystal growth mechanisms of large organic molecules recently appeared in Science in a paper by Adolf Winkler and his collaborators in Leoben. The inside cover of the August 18th issue of Advanced Materials features an organic transistor that can be used as a chemical sensor. This transistor and its chemically active layer were built studied by Egbert Zojer and his team. The papers mentioned here represent the best of a broad effort in solution processable electronics that will contribute to the development of distributed sensors, electronic books, lighting panels, displays, solar cells, and RFID technologies. Strategies will be discussed for using inorganic materials (including silicon) in solution based processes.