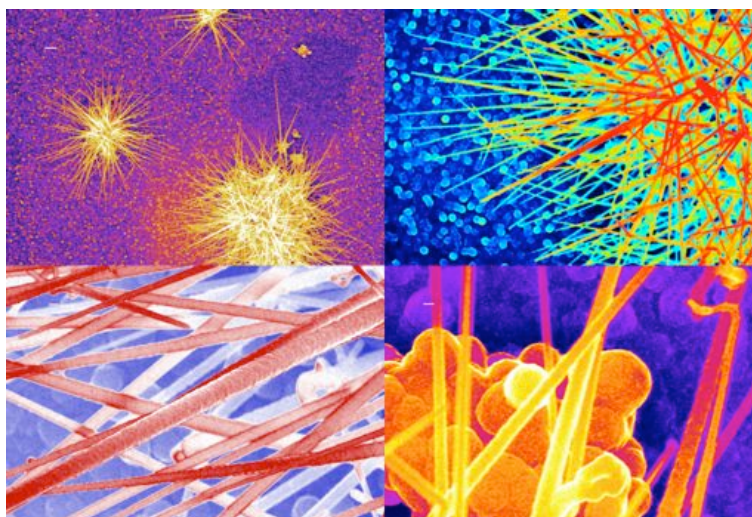


Experimental feasibility and performance of thin-film solar cells based on nano-structured silicon and semiconducting polymer



Pierre-Jean Alet will defend his PhD thesis in Materials Science
Friday, November 14th at 2pm,
at École Polytechnique (Becquerel lecture hall).
You are cordially invited to the defense and to the subsequent drinks.

Abstract: This thesis presents an exploratory work on a new design of hybrid solar cells, which are based on a junction between an inorganic material (silicon) and a polymer (P3HT). This structure is intended to improve the efficiency of organic based solar cells while maintaining low costs. Here, we investigate its experimental feasibility, and we analyze its performance.

The hetero-junction between silicon and P3HT has been studied on bilayer devices. We have shown that this junction generates electrical power under illumination, and that both silicon and P3HT can contribute to the photocurrent. Power conversion efficiencies up to 1.6% have been obtained. A large amount of work has been done to simplify the fabrication process and to improve its reliability.

Two new nano-structured silicon layers have been developed. "Nano-sponge" layers, where the typical dimension of domains is 20 nm, have been obtained by metal-catalyzed plasma-enhanced CVD at 175 °C. Silicon nanowires have been grown through a completely new process: the substrates are transparent conductive oxides, the catalysts are generated in situ, and the growth temperature is below 300 °C. The würtzite (Si-IV) phase has been identified in some wires, and various growth modes are observed. Both kinds of layers may also find applications in inorganic solar cells.

The talk will be in English