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Plasma synthesis of silicon nanocrystals as a new route for large area electronic applications PERE ROCA I CABARROCAS, CNRS/Ecole Polytechnique, ALEXEY ABRAMOV, KA-HYUN KIM, ERIK V. JOHNSON, LPICM TEAM — For over 30 years low pressure silane plasmas have been studied for the deposition of amorphous silicon thin films, which are today the basis of a fast expanding flat panel displays and more recently solar cells industries. This deposition technology holds the possibility of even larger implementations. Indeed, in order to make silicon thin film solar cells competitive, an increase in throughput along with an increase in material quality are required. To this end, in recent years we have focused on the synthesis of silicon nanocrystals in silane plasmas to be used as building blocks for thin film deposition, and have shown that in the case of polymorphous silicon films, indeed this approach allows one to increase simultaneously the deposition rate and cell efficiency. However, to increase the deposition rate even further ($>$ 1 nm/s) one would like to achieve high concentrations of silicon nanocrystals while avoiding their agglomeration. Here we will focus on the extension of these studies to nano, micro, and polycrystalline silicon thin films, as well as to epitaxial growth on crystalline substrates using nanocrystals. Moreover, doping of silicon nanocrystals and the synthesis of Ge, SiGe and SiC nanocrystals open exciting perspectives in this field.

Pere Roca i Cabarrocas
CNRS/Ecole Polytechnique

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