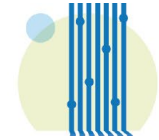




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Using the full potential of plasma processes for the deposition of thin film semiconductors: from amorphous to epitaxial films

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Plasma-Enhanced Chemical Vapor Deposition has experienced a tremendous development at research and industrial levels over the past forty years. Plasma diagnostics together with plasma modelling and in situ growth studies have provided increasing knowledge on the fundamental aspects of plasma processes and plasma surface interactions. This in turn has allowed successful transfer of processes to large area electronic industries in the field of photovoltaics and flat panel displays. Yet, the range of processes and applications is often bounded by our models which tend to simplify plasma processes. This is clear in the case of silicon thin films where animated debates have mobilized the community, for example on the role of SiH₃ radicals supposed to be the best film precursor for a-Si:H and microcrystalline thin film deposition, owing to its low reactivity and supposed long surface diffusion. On the contrary, plasma chemistry has much more to offer, in particular the fast formation of clusters and nanocrystals which can be advantageously used as building blocks for a wide variety of materials. Thus, in this presentation I will focus on the use of process conditions where radicals as well as clusters and nanocrystals contribute to growth. This has been successfully used in the past to produce polymorphous silicon thin films [1] and more recently to achieve epitaxial growth of silicon and germanium films [2] as well as p-type and n-type nanostructured nanocrystalline silicon oxide layers [3]. This approach has recently led to the successful epitaxial growth of silicon films at room temperature and the heteroepitaxy of GaAs layers via remote plasma epitaxy on virtual substrates consisting of a thin epitaxial Ge layer on a c-Si substrate.

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