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Hybrid materials by ALD-derived methods: opportunities for novel material design

Atomic layer deposition (ALD) has become the method-of-choice for solving many technical issues that occurred on the way towards designing current and future electronics. Serious effort has been invested in order to optimize the materials, processes and processing instrumentation, which eventually resulted in the success story of this processing technique. The ALD process allows controlled deposition of thin films on a variety of substrates and in this way enables a modification of a given functionality of a surface or even introduction of a new functionality. It may be seen as a chemical reactor that allows precise dosing of a chemical, allowing for chemical interaction and modification of the substrate. Considering both points of view, the process opens large variation possibilities for a design of novel functional materials for emerging applications and devices. Among those functional materials hybrid materials play an increasingly important role. By bridging the worlds of polymers and ceramics the most desirable properties can be united within a singular material. Furthermore, in a well performing hybrid material the individual components will add value to their counterpart in a synergistic way. In this talk, some approaches will be discussed that show great promise for establishing ALD as the method-of-choice for innovation in technological fields beyond the microelectronics industry. In an adapted processing mode, the ALD processing technology allows infusing metals into polymeric substrates, which leads to novel material blends that cannot easily be obtained in other ways. The chemical or physical properties of the initial substrate are improved or new functionalities added. With some showcases, this talk will discuss approaches towards non-traditional application of ALD to fabricate novel materials with great promise in various applications.

Biography

Mato Knez studied Chemistry and completed his Doctoral degree in Physical Chemistry at Max-Planck Institute of solid-state research in Stuttgart (Germany). In 2003, he moved for Post-doctorate studies to Max-Planck Institute of Microstructure Physics in Halle (Germany), where in 2006 he received the Nanofuture award of the German Ministry of Education and Research (BMBF) with a grant to establish a junior research group. Since 2012, he is Ikerbasque Research Professor in San Sebastian (Spain) and Group Leader of Nanomaterials at research institute CIC nanoGUNE. In 2012, he received the prestigious Gaede prize of the German Vacuum Society.

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