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Science and technology of thin films is in continuous progress. Interesting technological approaches and initiatives for accelerated materials discovery using machine learning are under development to meet the current trends of automation and data exchange in manufacturing technologies within what is called Industry 4.0 that involves cyber-physical systems, the Internet of things, or cognitive computing. In this context, it is of paramount importance not only the development of new materials with new or improved properties, but also the search of new smart sensors and self-reporting materials able to "communicate" in service general changes in their environment or even, report on possible damage/degradation by means of the variation of their chemical or structural properties. In this presentation, we will review few selected papers that focus on either fundamental aspects related to the control of thin film growth or to their innovative application as functional coatings to meet these challenges. Thus, it will be reported how the presence of residual gases during magnetron sputtering thin film growth can be used to control the microstructure of the deposits [1] of importance in industrial implementation, a clever way to study elemental diffusion in bimetallic systems [2], or the conditions to grow vertically aligned columnar nanocomposite thin films [3]. Other topics that will be addressed are the fabrication of thin films by agglomeration of nanoparticles [4] to control wetting properties of these films, or the identification of ultrathin magnetic structures [5]. On the other hand, several examples of functional coatings, such as the performance of transition metal dichalcogenides/ferroelectric systems as resistive switching for resistive random access memories [6], colorimetric energy sensitive scintillators based on luminescent multilayer designs or microfluidic liquid sensors based on porous films [7]

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[7] J. Gil-Rostra et al. ACS Appl. Mater. Interfaces 9, 16313 (2017). M. Oliva-Ramírez et al. Sens. Actuators B 256, 590 (2018).

Primary author(s) : YUBERO, Francisco (ICMS (CSIC, Univ. Seville)); Prof. DEPLA, Diederik (Department of Solid State Sciences, Ghent University,)

Presenter(s) : YUBERO, Francisco (ICMS (CSIC, Univ. Seville))

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