A review on metal oxide semiconductors applied to transistors: from nanofilms to nanoparticles

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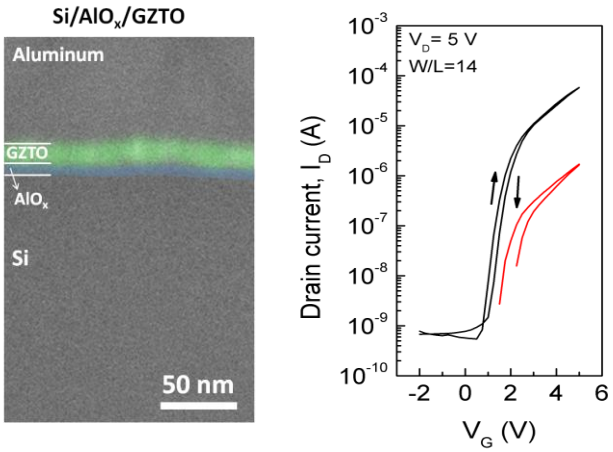
Abstract

In this work we will review some of the most promising new technologies for n- and p-type thin film transistors based on oxide semiconductors either in the form of nano-films or nanoparticles, with special emphasis to solution-processed, and we will summarize the major milestones already achieved with this emerging and very promising technology focused on the work developed in our laboratory.
Transparent electronics has arrived and is contributing for generating a free real state electronics that is able to add new electronic functionalities onto surfaces, which currently are not used in this manner and where silicon cannot contribute [1,2]. The already high performance developed n- and p-type TFTs have been processed by physical vapour deposition (PVD) techniques like rf magnetron sputtering at room temperature which is already compatible with the use of low cost and flexible substrates (polymers, cellulose paper, among others). Besides that a tremendous development is coming through solution-based technologies very exciting for ink-jet printing, where the theoretical limitations are becoming practical evidences. In this presentation we will review some of the most promising new technologies for thin film transistors based on oxide semiconductors and its currently and future applications.

References

[1] E. Fortunato, P. Barquinha, and R. Martins, "Oxide Semiconductor Thin-Film Transistors: A Review of Recent Advances," Advanced Materials, vol. 24, pp. 2945-2986, Jun 2012.
[2] P. Barquinha, R. Martins, L. Pereira and E. Fortunato, Transparent Oxide Electronics: From Materials to Devices. West Sussex: Wiley & Sons (March 2012). ISBN 9780470683736.

Figures



High resolution FIB-SEM cross-section images and transfer characteristics of bottom gate TFTs produced with solution based GZTO and water-based AlOx.