Electrical stability enhancement of the amorphous In-Ga-Zn-O thin film transistor by formation of Au nanoparticles on the back-channel surface

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Abstract

We demonstrate a significant improvement in various electrical instabilities of amorphous indium gallium zinc oxide (a-IGZO) thin film transistor (TFT) by implanting Au nanoparticles (NPs) on the a-IGZO back-channel. This TFT showed the enhanced stability of threshold voltage (V_{th}) under ambient humidity, illumination stress, and a-IGZO thickness variation tests. Application of back-channel Au NPs to a-IGZO TFT is regarded to control the surface potential, to lead reversible carrier trap/injection, and to increase incident UV light absorption by local surface plasmon. Au NPs are formed by e-beam evaporation, and therefore, this technique can be applicable to the TFT manufacturing process.

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Additional information

Since amorphous indium gallium zinc oxide (a-IGZO) was introduced as a fascinating channel material for thin film transistors (TFTs) in 2004, a-IGZO TFTs have received enormous attention due to its superior properties of high mobility, low temperature deposition, and high transparency compared to those of conventional amorphous silicon for the flat panel display. Despite great advances of a-IGZO TFTs, their electrical instability and non-uniform electrical properties upon the large scale application have made it difficult to fully apply a-IGZO TFTs in industrial fabrication.A guarantee of device stability and uniform film quality under various external conditions is thus essential for application of a-IGZO TFTs in commercial fields. Our lab (advanced electronic/energy materials lab, aeem.ajou.ac.kr) has a strong research focus on improving a-IGZO channel to make technical breakthroughs in addressed problems. In the featured paper, we propose a special technique for a great

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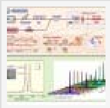

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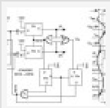

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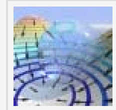

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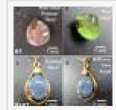

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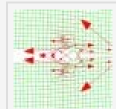

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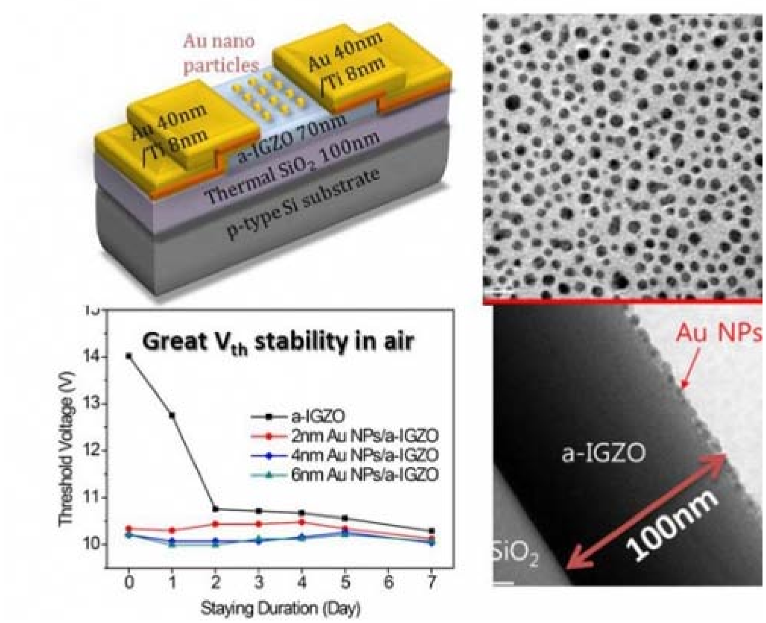

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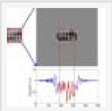

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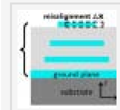

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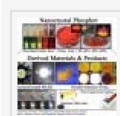

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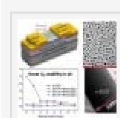

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