PÔSTER - DISPOSITIVOS ELETRÔNICOS E ÓPTICOS
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ALUMINUM OXIDE THIN FILMS FOR MEMORY DEVICES AND TRANSISTORS

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The use of dielectric materials such as aluminum oxide has been recurrent in the optoelectronic device industry. This material have characteristics such as high resistivity and permeability, high resistance to radiation, very high dielectric constant and good thermal conductivity, in addition to transparency over a wide range of wavelengths. These characteristics, when used in devices such as memories and transistors, play fundamental roles in their performance [1]. In transistors, this oxide layer acts as a barrier controlling the flow of electrons between the semiconductor material (which can be a polymer) and the metallic contact. In memories, the oxide layer acts as a tunneling barrier between the different layers that make up the device, allowing the storage of electrical charges[2,3]. Morphology and thickness of this layer directly influences device performance. Growing or deposition of this layer can be done by different

techniques, such as plasma treatment, thermal oxidation or anodization. Among the aforementioned techniques, anodizing is a lower cost alternative, as it does not require a controlled atmosphere, such as vacuum or inert gas. Anodizing is an electrochemical process that involves the controlled oxidation of the metal through a redox reaction, generating a thickening of the oxide layer on the surface of the material. In this type of experiment, the metallic film is adopted as the anode (positive pole) in a voltage source, while the cathode is conductive material and inert to the electrochemical reaction. During this process, an electric current is applied to the electrolyte, causing the accumulation of ions on the surface of the metal, thus generating oxidation. Studies show a dependence between time and voltage applied in the experiment, with oxide growth being directly proportional. In this work, we performed the deposition of aluminum films on a glass substrate that received the anodizing treatment for the growth of the native oxide layer at different values of voltage, time and, consequently, electric current. For electrolyte solution, H3PO4 at 0.4M was used and platinum electrode as cathode. Preliminary experiments have shown that increasing the aluminum oxide layer generates an increase in film transparency. This characterization was carried out using the UV-Vis technique, where analyzes of the absorbance and transmittance spectra of the material were performed. The thickest oxide samples had a transmittance around 85%, whereas the thinnest sample had a transmittance around 10%. In the analysis of the absorbance spectra, we turned attention to estimate oxide thickness, however it was different from the spectrum of a pure aluminum oxide from references. This difference may be attributed to impurities, such as phosphate ions,[3,4] incorporated during anodizing process. After characterization of oxide layer memory devices using the architecture Al/Al2O3/MEH-PPV/Al are under characterization using different techniques like AFM, Kelvin Probe, I-V and UV-vis.

References

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