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Diagnostic of Magnetron Sputtering by using a Passive Thermal Probe

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Plasma surface processes (e.g. magnetron sputtering) have enabled the production of different thin films and devices, leading this way to new technologies for research and industry. A strong correlation between the film properties and process parameters is proven, which makes the diagnostic of the process plasma necessary in order to understand and manipulate the deposited films.
Recently, we have been able to study the plasma parameteres during the production of memristive devices [1]. Memristive devices are valued for their non-volatile electronic property, which allows them to store their resistance even after the power supply is switched off. According to this, they can be applied in image processing algorithms or even neuromorphological circuits in order to build brain-like chips. Since the investigated films are deposited by magnetron sputtering, it is important to understand the physics of the discharge through plasma diagnostic. Therefore, we used a passive thermal probe, which can be operated simultaneously as a calorimetric probe for energy flux measurement, and as a planar Langmuir probe for measuring the floating and plasma potentials as well as the electron temperature [2].
The passive thermal probe has also been used during many other coating processes such as sputtering of magnetoresistive films [3]. Through their ability of matching the electric resistance to the applied magnetic field, they received importance in contactless position and angle measurements. With the plasma diagnostic method radial measurements across the substrate region and for the operation of one or more targets can be performed. Based on the results we can explain possible radial variations along the films and conclude for dominating factors affecting the films electric or magnetic properties, respectively.
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