

Creation of a Mechanical Material-Cutting System with Potential for Use in Low-Cost Nanotechnology

Ovares-Sandi, Isaac

Chacon-Morua, Pablo

The project is focused on designing, building and programming a material-cutting mechanical system for applications in Nanotechnology and chemical analysis. Usually the cutting process relies on expensive, bulky machinery that being a manual procedure poses potential risks for the operator. The prototype was built from recycled parts of other machines; it has a simple structure and is very easy to operate. The machine can be used in any laboratory even by inexperienced operators. The machine comprises electric shafts controlled by stepper motors. It presents an XY movement on the bench plane, the X axis moves the Y shaft, and the "Y" shaft houses the cutting tool. The Arduino and Easy Driver control the pulses that drive the motor, providing Y more accuracy in its movement; the device can also be equipped with different types of cutting tools, according to the type of material and application. The application that was developed during this project was the new generation of transistors based on Molybdenum disulfide, a material that is of great interest in Electronics and Nanotechnology. The cutting system was used to prepare the Silicon substrates with the dimensions required for the installation of the transistor. The samples that were obtained were characterized through AFM and SEM for quality assurance. It was concluded that the cutting machine has the proper precision, is affordable and provides samples of the expected quality.