

CONTEMPORARY METALLIC MATERIALS

Md Abdul Maleque
Iskandar Idris Yaacob
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Edited by:

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Green Nanotechnology using SEM and AFM

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Abstract: Green nanotechnology covers the nanoscale science and technology that could have positive consequences for the environmental movement. In this paper, two green nanotechnologies have been shown by a scanning electron microscope (SEM) and an atomic force microscope (AFM) for respectively generating nano-current density to produce surface electrical breakdown for evaluating insulation property, and for novel nanofabricating SiO₂ on a silicon wafer.

Introduction

Nanotechnology has come to have two primary meanings: (1) new science and technology that takes advantage of properties operating at the nanoscale, and (2) building with atomic precision through the use of molecular machine systems [1]. The first meaning refers to developments occurring today; the second to an ambitious technological goal at least a decade off. Nanotechnology has the potential to be used to develop new “green” processing technologies that minimize or eliminate the use of toxic materials and the generation of undesirable by-products and effluents. Research may involve nanotechnology related to improved industrial processes and starting material requirements, development of new chemical and industrial procedures, and materials to replace current hazardous constituents and processes, resulting in reductions in energy, materials, and waste generation [2].

Further, nanoscale devices and equipment provide benefits in terms of an improved greener environment, miniaturization, efficiency and resource consciousness. Nanotechnology has accelerated research and development in many disciplines. However, a key obstacle to its development remains in the need for cost-effective large-scale production methods. Nanotechnology has applications in many fields including automotive, aerospace, household appliances, sporting goods, telecommunication equipment and medical supplies [3].

Surface breakdown or flashover has been studied for many years using high voltage, high energy and a bulk material as a sample [1]. Since a flashover can be produced by bombarding a sample using nano current density generated by an electron gun in a SEM [5-7], this technique later is used to evaluate an insulation property for industrial application. This paper will introduce the principle technique and its uses for characterizing insulator for protecting layer in plasma display panel and materials applied for spacecraft and space station.