corresponding characteristics were measured; the role of the dopants and plasma-induced surface chemistry of SiNCs is discussed.

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ENR-29

Nano scale Characterisation of Photovoltaic Ultra Barrier Films

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Abstract

This paper reports on the recent work carried out as part of the EU funded NanoMend project. The project seeks to develop integrated process inspection, cleaning, repair and control systems for nano-scale thin films on large area substrates.

Defects in Roll to Roll produced in thin film ultra barriers films applied to flexible PV allow permeation of water vapour and/or oxygen through to the underlying substrates[1]. These defects are believed to be inherently present in large scale vacuum-deposited layers because of imperfections in the deposition process (intrinsic defects) or as a result of the presence of contaminants in the vacuum chamber or on the coated substrate (extrinsic defects)[2]. Additionally, the base film inherent roughness can have a highly detrimental effect on the barrier performance. Therefore, when the base material (polymer) is coated with a barrier layer such as Al_2O_3, the barrier performance of this multilayer structure can also fall short of the stringent water vapour transmission rate requirements for PV applications ($<5x10^{-5}g/m^2$/day). One solution, the subject of this investigation, is the addition of a planarised hard coat to the film surface. This coating is deposited as a wet coat to the polymer during manufacture and acts to increase the smoothness of the surface by capturing existing debris and counteracting the effect of scratches which may be present on the raw base film after production.

A comprehensive study of barrier film defects was performed utilizing atomic force microscopy (AFM), scanning electron microscopy with a focused ion beamsystem (SEM/FIB), and white light interferometry (WLSI). The study investigated the effect of

the planarisation process on the barrier film defects density, where three different samples were investigated: Polyethylene Naphthalate substrate planarised Polyethylene Naphthalate substrate and planarised coated Polyethylene Naphthalate substrate). These three samples were taken from the same manufacturing roll. The study concluded that whilst intrinsic barrier layer defects cannot be avoided, the use of planarisation greatly reduces the overall number and severity of defects by creating a very smooth surface for PV barrier layer application.

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ENR-30

Fabrication of Bar-Coded Metal Nanowires

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Abstract

The aim of this project is the preparation of gold, silver and gold–silver composite nanowires via the electro deposition process using an alumina membrane with 0.2 micrometer pores acting as a template for the formation of the metal nanowires.
A key issue in the development of nano-wires and molecular scale-electronics is the fabrication of devices that can be assembled in circuits. This project is devoted to the preparation of metallic nanowires containing alternating strips of two or more different metals, such as gold and silver. The scheme for the preparation of such devices relies on the electroplating deposition of the metal into the pores of an anodised alumina membrane by the subsequent exposure of the membrane to solutions of two metal salts of different concentrations and electrolysis durations. The dissolution of the membrane template leads to the formation of “barcoded nanorods”. The properties and self-assembly of these nanorods were studied using SEM and optical microscopy combined with directed assembly in an AC electrical field. It was also attempted to functionalise specific stripes of the bar-coded nanorods with proteins to produce a barcoded nanosensor device.