

Analytical Solutions

May 9, 2007 (Version 2.0)

for BioTechnology

BN 1504

Measuring the Morphological Structure of Porous Materials

Introduction

Porous materials are important in many industries including pharmaceuticals, tissue engineering, and biomedical technology. Applications for these materials include protein separation, drug delivery, surface modification, scaffolding for tissue growth, and support material in implant technology. The ability to determine parameters such as pore size, pore shape, and interconnectivity are critical in research and development in the areas of filtration, permeability, tissue engineering, cell sustainability, and timed release of active pharmaceutical materials.

Discussion

Current technology produces porous structures with pore sizes and fiber diameters on the order of nanometers. The low-voltage field-emission scanning electron microscope (FE SEM) is ideally suited for characterizing the morphology of porous materials. FE SEM provides the combination of high spatial resolution and depth of field which are necessary for imaging these materials. In addition the FE-SEM can be operated at low accelerating voltages without a substantial loss of resolution. Operating at 1keV minimizes charging, beam damage, and the necessity for additional sample preparation. Imaging at lower voltages also provides more sensitivity to the delicate surface features common in these systems. FE-SEM images of the top and bottom exterior surfaces and the cross-sectioned interior pore structures of a filter membrane are shown in Figure 1.

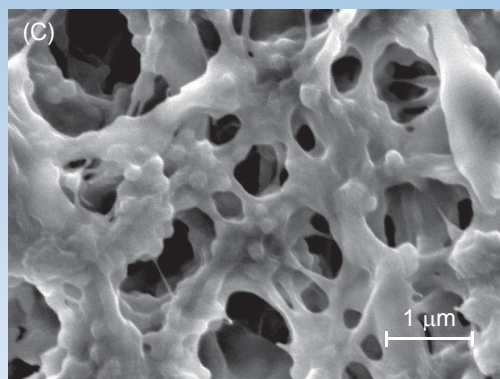
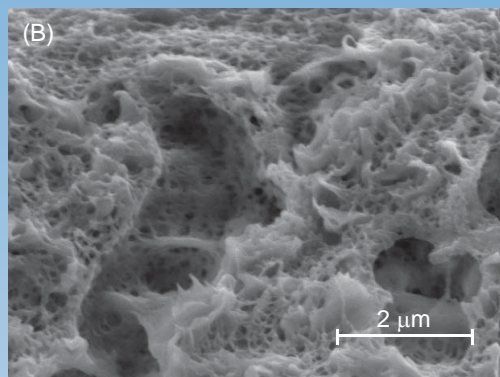
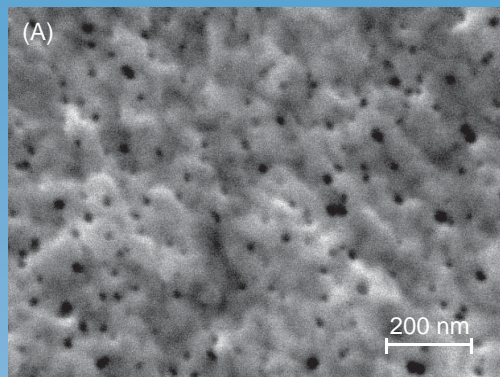
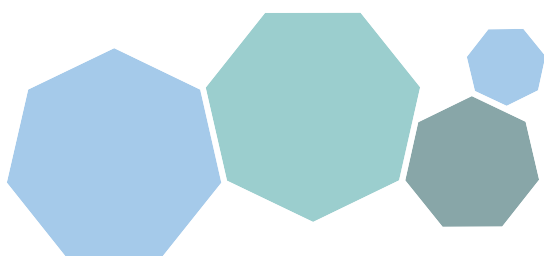


Figure 1. FE-SEM images of (A) top exterior surface, (B) interior cross-section, and (C) bottom exterior surface of a filter membrane.



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