

**Characterization and Integrity Testing of Filtration Membranes Utilizing a Unique
Corona Beam Technology
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ABSTRACT

There have been decades of non-destructive testing developments in the filtration membrane industry. This article proposes a new and unique technology that has the capability to surpass the current standard methods of NDT. This paper deals with the characterization of porosity, permeability and integrity testing of conductive and non-conductive filtration membranes and filtration coating materials. This can be determined by utilizing a novel electron beam technology and electronic instrumentation in an open atmosphere for 100% testing in a non-destructive, real-time, on-line testing technology.

An electron beam developed in an open atmosphere maintains a prescribed and applied frequency through the use of a nitrogen cover gas, ionizing the gas to create a Corona Beam. The Corona Beam discharge is maintained at a very high positive voltage. A "point-to-point effect" is developed from an anodic needle point in the Corona Beam Gun and forms a cathodic point from the holes or anomalies in the filtration membrane material. When the two electrodes get near each other a discharge occurs. The anomaly lacks dielectric strength and therefore releases electrons to the anodic powered needle in the gun. The Corona Beam has a frequency imposed on it and the signal changes to respond to the amount of electron flowing and the changes that occur in the disruption of the frequency signal. The processor detects the change of the two elements and digitizes it for analysis. Through this technique the system can determine the presence of micron and nanometer sized voids or holes, as well as any other type of anomaly. The process can also utilize an established range of acceptability to certify materials that require a well defined level and distribution of porosity or permeability. This process can be performed by the manufacturers of raw film material. This process can be performed by the filtration membrane developers and processors to certify a specific quality level. It can be performed by the material fabricators to ensure quality standards prior to fabrication. There are many other filtration applications that can utilize this technology for coatings that are used as filtration media. Validation and integrity testing within the filtration, pharmaceutical, chemical, medical device, and food processing industries can use this technology for many different integrity testing applications.

Keywords: Microfiltration (MF), Ultrafiltration (UF), Nanofiltration (NF), Reverse Osmosis Membranes (RO), Electron Beam, Corona Beam, Integrity Testing, Material Characterization, Filtration Membranes, Membranes Film & Coatings, Composite Filtration Media, Nano-Technology, Non-Destructive Testing (NDT), Permeability, Porosity, Test & Measurement,