

Comparative Methods for the Pore Size Distribution of Woven and Metal Filter Media

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Abstract

This paper investigates the comparability of several multi-layered, woven filter media using air, water and bubble point methods. Estimated filter efficiencies from the bubble point measurements were then compared to a new sonic challenge test method where precision micropheres are flushed through the pores. Inconsistencies in the bubble point filter efficiencies were found to be dependent on the openness or permeability of the weave. The filter efficiency of a non-woven metal filter medium was then related to the pore size distribution measured by microscopy.

Key words: Permeability, woven filter media, metal filter media

1. Introduction

In order to permit clean filter through materials the pore structure is clearly defined as often viewed under a microscope an aperture can be observed with increased definition from the top and side. However, Figure 1(a), in most cases it is possible to measure across the opening (in each direction) to get an indication of the pore structure.

Microscopic aperture measurement is not possible however on composite or double-layered weave (DLW) structures similar to those in Figure 1 (b). When viewed from the top surface it is difficult to see through the fibres (unless it is extremely loose). In most cases the cross-sectional path through a composite or DLW is a tortuous one with interweaving between the layers. Furthermore, increasingly lighter weaves in the same weave class, become severely fine; the use of microscopy as an analytical tool to measure aperture size.

In complex, 3-dimensional filter media, permeability via capillary flow from wetted media has long been used for assessing the relative pore size distribution (RSDC). Theoretically it is based on the Laplace equation for cylindrical capillary pores (ASTM F-330-80 and (see ASTM)). However, most filter media have irregular pores, which makes the theoretical assumptions suspect and this is especially the case in multi-layered structures. Nevertheless, permeability has been firmly established as a low cost procedure for filter media characterisation, and now can even be successfully used to assess efficiency.

Many investigators used the standard bubble point method for RSDC determinations, but with the advent of the Coulter's permeometer in 1988 this task has become relatively easy. In the ensuing years many other permeometers have been introduced.

Using multi-layered woven media, as shown in Figure 1, this paper compares four methods of pore size analysis based on permeability testing. In addition it will compare permeability data with that of direct so-called 'Challenge test'. In this method standard test dusts or glass beads are presented to a filter medium and the particles in the downstream phase analysed.

In the least development of the method, accurately calibrated, narrow size distribution glass microspheres have been produced covering the size range 2 - 500µm in 20 grades. Knowing the size distribution by weight eliminates the need for particle sizing equipment as the pore size can be directly related to the percentage of the standard passing the filter medium through a calibration graph or formula.



(a) Top view (b) Double layered weave
Figure 1.

Comparative Methods For The Pore Size Distribution

Guillaume Favre



Comparative Methods For The Pore Size Distribution:

Molten Salts Chemistry Frederic Lantelme, Henri Groult, 2013-08-14 Molten salts and fused media provide the key properties and the theory of molten salts as well as aspects of fused salts chemistry helping you generate new ideas and applications for fused salts Molten Salts Chemistry From Lab to Applications examines how the electrical and thermal properties of molten salts and generally low vapour pressure are well adapted to high temperature chemistry enabling fast reaction rates It also explains how their ability to dissolve many inorganic compounds such as oxides nitrides carbides and other salts make molten salts ideal as solvents in electrometallurgy metal coating treatment of by products and energy conversion This book also reviews newer applications of molten salts including materials for energy storage such as carbon nano particles for efficient super capacitors high capacity molten salt batteries and for heat transport and storage in solar plants In addition owing to their high thermal stability they are considered as ideal candidates for the development of safer nuclear reactors and for the treatment of nuclear waste especially to separate actinides from lanthanides by electrorefining Explains the theory and properties of molten salts to help scientists understand these unique liquids Provides an ideal introduction to this expanding field Illustrated text with key real life applications of molten salts in synthesis energy nuclear and metal extraction

Recent Advances in the Science and Technology of Zeolites and Related Materials

,2004-12-18 Recent Advances in the Science and Technology of Zeolites and Related Materials **Zeolites and Their Applications** Mohamed Nageeb Rashed, P.N. Palanisamy, 2018-06-27 Zeolites are hydrated aluminosilicate minerals of the family of microporous solids According to the US Geological Survey there are about 40 naturally occurring zeolites forming in sedimentary and volcanic rocks The most commonly mined forms include clinoptilolite chabazite and mordenite There are over 200 synthetic zeolites For their abundance natural and synthetic zeolites are widely used in the industry agriculture water treatment wastewater treatment and as dietary supplements to treat diarrhea autism cancer and other This book Zeolites and Their Applications deals with several aspects of zeolite morphology synthesis and applications The book is divided into three sections and structured into nine chapters The first section includes the introductory chapter the second section explains mineralogy morphology and synthesis of zeolites and the third section focuses on the different applications of both natural and synthetic zeolites So in this book the readers will obtain updated information on mineralogy morphology synthesis and application of zeolites Scientists from different scientific fields reported in this book their findings

Characterization of Porous Solids VI ,2002-11-14 This book contains 99 of the papers that were presented at the 6th in the series of Symposia on Characterization of Porous Solids held in Alicante Spain May 2002 Written by leading international specialists in the subject the contributions represent an up to date and authoritative account of recent developments around the world in the major methods used to characterize porous solids The book is a useful work of reference for anyone interested in characterizing porous solids such as MCM 41 mesoporous materials pillared clays etc Papers on pore structure

determination using gas adsorption feature strongly together with papers on small angle scattering methods mercury porosimetry microcalorimetry scanning probe microscopies and image analysis

Pore Structure of Cement-Based Materials Kalliopi K. Aligizaki, 2005-09-22 Pore Structure of Cement Based Materials provides a thorough treatment of the experimental techniques used to characterize the pore structure of materials The text presents the principles and practical applications of the techniques used organized in an easy to follow and uncomplicated manner providing the theoretical background the way to analyze experimental data and the factors affecting the results The book is the single comprehensive source of the techniques most commonly used for pore structure analysis covering simple techniques like mercury intrusion porosimetry and water absorption to the more sophisticated small angle scattering and nuclear magnetic resonance The book is an essential reference text for researchers users and students in materials science applied physics and civil engineering who seek a deep understanding of the principles and limitations of the techniques used for pore structure analysis of cement based materials

Experimental Methods in Catalytic Research Peter T. Dawson, 1968 Vols 2 edited by R B Anderson and P T Dawson

Petroleum Generation, Migration and Storage in Shale System Xiaomin Xie, Feng Yang, Jianhua Zhao, Juan Teng, Tao Hu, Chunqing Jiang, Jun Wang, 2023-11-16 Shale resource systems include conventional source rocks unconventional resources such as shale gas and shale oil system Regardless of the type of shale resource system the issues of petroleum formation processes including petroleum generation migration and storage are very important in petroleum evaluation and exploration Because of the complicated and different geological settings in the world the evaluation approaches and workflows may not be easily implemented following those from successful examples Thus the mechanisms of petroleum formation are fundamental for petroleum exploration and production all over in the world The reason this special issue focuses on the shale system is because the shale system is not only the main source rock type but also the main unconventional reservoir type in the world

Role of Interfaces in Environmental Protection Sandor Barany, 2012-12-06 The NATO Advanced Research Workshop Role of Interfaces in Environmental Protection has been held on May 27 30 2002 in Miskolc Hungary under leadership of co directors Prof Sandor Barany from the University of Miskolc Hungary and Prof Nataliya Klymenko National Academy of Sciences of Ukraine The objective of the ARW was to highlight colloidal and biocolloidal aspects of environmental pollution and technologies to monitor remediate abate and prevent pollution It is known that the solution of majority of environmental problems is closely connected with phenomena at the interfaces The behaviour transport of dispersed particles in the environment the main phase separation methods in water treatment purification of liquids aerosols removal many soil remediation processes as well as the methods of protection of human organisms from hazardous matters are based on concepts of colloid chemistry i e properties of interfaces and their behaviour in different media Examples of these methods are filtration ultrafiltration flotation coagulation hetero coagulation and flocculation adsorption adhesion of micro organisms to surfaces membrane separation methods etc A very important and special aspect of

the topic is the human protection using colloid chemical approaches i e the adsorption aggregation and adagulation properties of differe t materials Examples are adsorption of hazardous organic materials drugs heavy metals and radionuclides on activated carbon silica cellulose derivatives etc Kinetics and Catalysis ,1986-07 **Chemical Abstracts** ,1927 Geotechnical Abstracts ,1976 **Energy Research Abstracts** ,1982 *Paper Trade Journal* ,1930 **Battelle Technical Review** Battelle Memorial Institute,1952 **Proceedings of the Fifth International Conference on Geotextiles, Geomembranes, and Related Products, Singapore, 5-9 September 1994** G. P. Karunaratne,S. H. Chew,K. S. Wong,1994 **Dielectric Films for Advanced Microelectronics** Mikhail Baklanov,Martin Green,Karen Maex,2007-03-19 The topic of thin films is an area of increasing importance in materials science electrical engineering and applied solid state physics with both research and industrial applications in microelectronics computer manufacturing and physical devices Advanced high performance computers high definition TV broadband imaging systems flat panel displays robotic systems and medical electronics and diagnostics are a few examples of the miniaturized device technologies that depend on the utilization of thin film materials This book presents an in depth overview of the novel developments made by the scientific leaders in the area of modern dielectric films for advanced microelectronic applications It contains clear concise explanations of material science of dielectric films and their problem for device operation including high k low k medium k dielectric films and also specific features and requirements for dielectric films used in the packaging technology A broad range of related topics are covered from physical principles to design fabrication characterization and applications of novel dielectric films *Transactions and Journal of the British Ceramic Society* British Ceramic Society,1926 Vols for 1971 74 include a separate section with title British ceramic abstracts prepared by the British Ceramic Research Association also issued separately *European Pharmacopoeia* Consejo de Europa. Dirección para la Calidad en los Medicamentos,2013 Transactions of the ASAE. American Society of Agricultural Engineers,1987 *GeoArabia* ,1999

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