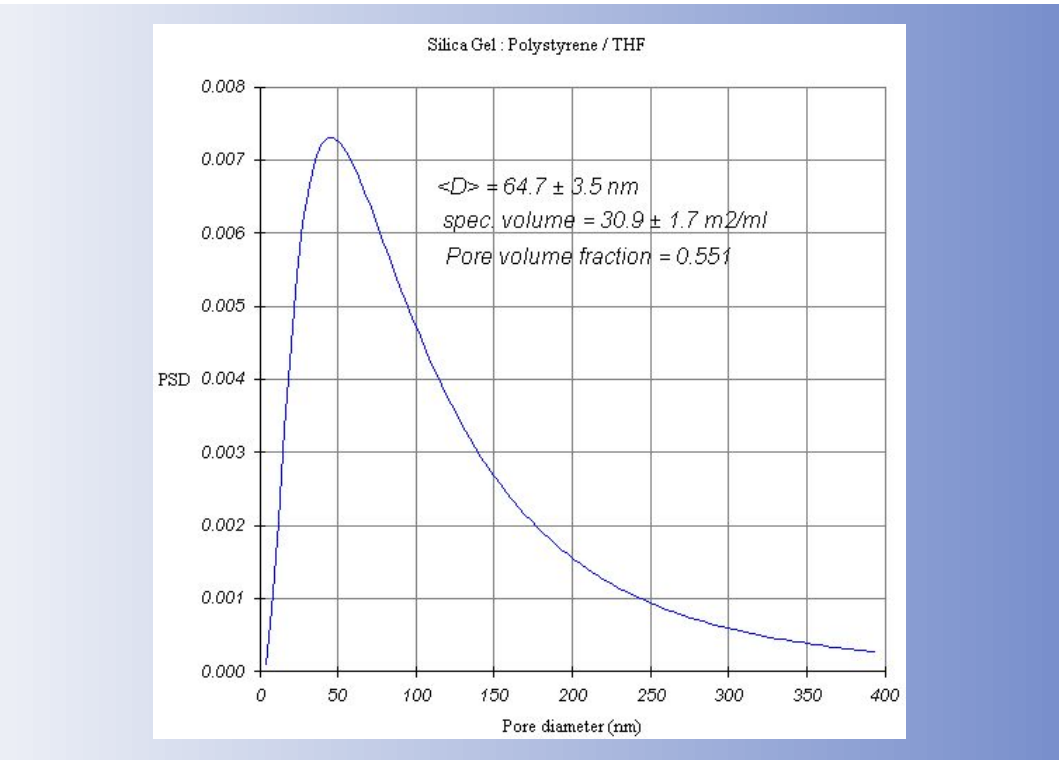
Dynamic Pore Size Determination with PoroCheck

Chromatographical analysis under real conditions



The PoroCheck Software

POROCHECK is an easy to use software that performs the comprehensive pore size analysis of various porous materials.
It uses standard chromatographic equipment to investigate porous structures (in diffusion experiments) without relying on specialized and high-priced instruments or requiring toxic substances
PSS developed this new software in collaboration with Prof. Gorbunov of St. Petersburg, an internationally known expert in the determination and modeling of pore size distributions.

The Application

Traditional methods, which seldom reflect the reality, examine empty pores under static conditions.
The chromatographic porosimetry which is employed in this method determines pore properties under dynamic conditions present in processes. The software not only measures the pore size distribution over a range from 5 to 6000Å, but also determines additional important properties such as pore volume, specific surface area, pore selectivity for special particle/molecule sizes, or optimal size of a guest molecule.
Some typical applications are: catalysts and catalyst supports, ion exchange resins, ceramics, nano materials, absorbents, high throughput screening carriers, drug delivery systems, or bio-reactors.

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The Method

POROCHECK uses recognition of porous structures by diffusion of test molecules of different size into the pores under normal operating conditions of the porous material (e.g. no vacuum). This means that POROCHECK can also measure fragile samples and investigate materials in different states (dry, swollen, partially adsorbed). Chromatographic porosimetry has proven to be a very useful method. It relies on the permeation of test molecules into the porous material and relating sample retention to pore size using chromatographic separation. The best and most widely available instrument for running the analysis is a conventional LC instrument. It needs no additional training as would be the case with a gas adsorption or Hg intrusion device.
The pore size distribution is calculated based on a flexible chain model assuming fixed pore boundaries. Cylinder and slit models are available to describe the pore structure. Detailed analysis of pore accessibility yields to a multitude of analytical results which can be derived from the pore size distribution.

POROCheck Analysis Results

Sample: Testmuster (lot#: 1290819629)
Polymer / Solvent: Pullulan/Water
Comment: Pore Size Analysis by inv. SEC
Pore volume and surface area:
Pore volume fraction $Vp/(V0+Vp) = 0.526$
Specific surface area $S = 76.7 \pm 25.7$ m^2/cm^3
Parameters of the pore size distribution (PSD):
Average pore radius $<R> = 26.1 \pm 8.1$ nm
Width of the PSD $s = 45.4 \pm 6.6$ nm
Reduced PSD width $s/<R> = 1.74 \pm 0.72$
SEC selectivity parameters:
Maximum selectivity factor = 46 %
Optimal molecular diameter = 23.0 nm
Optimal molecular weight = 166000 D
Optimal K value = 0.458
MW range = 3.12 MW decades (3400 - 4461500) D
Mol. size range = 1.6 size decades (3.1 - 123.9) nm

The Unique Advantages

- huge dynamic pore size range, spanning from 5Å to over 6000Å.
- high accuracy across the complete pore size range
- cost effective and easy to use because it utilizes existing laboratory equipment
- measures porous materials in their native state (not in high vacuum or under high pressure)
- truly accessible pores are investigated. Bottle neck pores or pores without external access are not screened
- no need to dry porous material. It can be used in wet or swollen state without applying any pressure depending on the requirements of the application.
- no toxic compounds (like Hg) required
- no expensive liquified gases (like N_2) are needed
- fast and easy sample comparison through the powerful overlay capabilities. Even small differences can be determined reliably by applying different views to the data
- no specific cost for maintenance
- runs on any 32 bit Windows operating system.

Specifications	Description
Poresoft	POROCHECK Software for pore size analysis under Windows PC minimum requirements: 486 Processor, 66 MHz, 24 MB RAM, SVGA Grafic, 256 colors, CD ROM or disk drive
Porekitorg	Starter kit for pore size analysis with software, Polystyrene size standards for organic eluents, empty test column and easy-to-use instructions
Porekitwss	Starter kit for pore size analysis with software, Pullulan size standards for aqueous eluents, empty test column and easy-to-use instructions

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