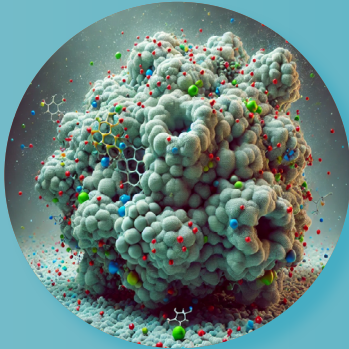




**Surface Measurement Systems**  
World Leader in Sorption Science

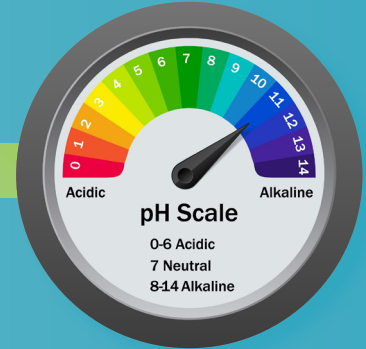
## Optimize Catalyst Performance & Predict Real-World Behavior



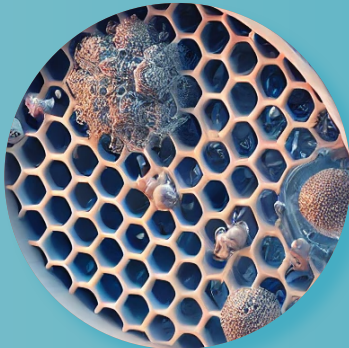
Surface  
Area



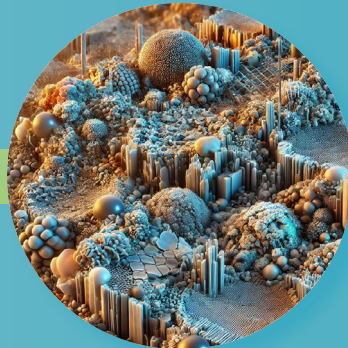
Sorption Isotherms  
& Kinetics



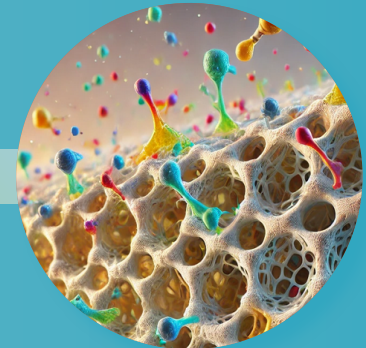
Acid/Base Surface  
Functionality



Permeability &  
Selectivity



Surface  
Heterogeneity



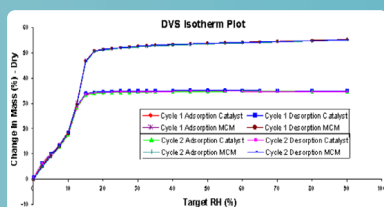
Reactant  
Selectivity

Unlock your research potential with advanced sorption analyzers, delivering unmatched materials characterization to revolutionize catalytic materials development.



# Empowering Material Characterization for the World's Leading Catalysts Developers

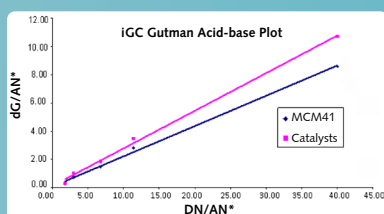
## Our Instruments in Action



Two complete Hexane adsorption/desorption cycles for MCM41 and the catalyst, measured by DVS at 25 °C

Sample	$W_A^d$ ( $\text{mJ}/\text{m}^2$ )	$\gamma_S^d$ ( $\text{mJ}/\text{m}^2$ )	$\gamma_S$ ( $\text{mJ}/\text{m}^2$ )	$\gamma_S^*$ ( $\text{mJ}/\text{m}^2$ )
MCM 41	58.54	47.89	79.68	49.55
Catalyst	69.30	67.11	119.14	33.92

Thermodynamic parameters obtained from a DVS experiment



Gutmann acid-base plot (from an IGC SEA experiment with Ethyl acetate, Acetone, Acetonitrile, THF and Ethanol)

### Case Study 620

**The Problem:** Understanding the acid-base and surface energy characteristics of catalysts is critical for optimizing catalytic efficiency and reaction performance. This study examines how the inclusion of ruthenium oxide on MCM41 alters its surface properties. Accurate characterization helps in tailoring catalysts for specific applications involving adsorption, reaction selectivity, and stability.

**The Techniques:**

- Dynamic Vapor Sorption (DVS)
- Inverse Gas Chromatography (iGC)

**The Research:** Dynamic Vapor Sorption (DVS) and Inverse Gas Chromatography (IGC SEA) were used to measure surface energy, acidity, and basicity of a  $\text{RuO}_2/\text{MCM41}$  catalyst and its pure MCM41 support.

**The Results:** The  $\text{RuO}_2$  catalyst exhibited higher surface energy and greater basicity than MCM41, despite having lower surface area and sorption capacity. Both techniques confirmed the catalyst's more neutral acid-base character versus the support's stronger acidity. These findings demonstrate how metal oxide loading modifies surface thermodynamics, influencing catalyst behavior in real applications.

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