

# Characterising the Surface Properties of Complex Particulate Solids using Inverse Gas Chromatography

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## Abstract

The surface energy of particulate materials may influence a range of important properties including adhesion, wettability, dispersivity and flowability. Thus, a comprehensive understanding of the wetting properties of particulate solids for example is of both a fundamental and practical importance in materials manufacturing and process engineering.

Despite the importance of surface energetics for solids, few experimental techniques have shown themselves to provide reliable and robust data for real world solids. One of the most successful techniques for surface energy characterisation of powders and fibrous materials is Inverse Gas Chromatography (IGC). In IGC, the unknown solid state material is packed into a narrow bore column, and eluted via a carrier gas with known vapors and gases, similar to a regular analytical GC experiment. Here the resultant solute-solid retention behaviour is used to determine the surface thermodynamic properties of the solid sample.

As well as reviewing this experimental technique, a number of recent examples will be described which illustrate the power and versatility of this experimental method:

- Surface properties of cellulosic materials including cotton and avicel
- Processing effects (milling and granulation) on pharmaceutical solids surface properties
- Comparison of wetting and IGC data for a model crystalline solid system
- Heterogeneity energy mapping of complex solid surfaces