



# XIGO NANOTOOLS ACORN AREA

## Facility Overview & Capability Profile

The Xigo Nanotools Acorn Surface Area Analyser is a non-invasive and non-destructive lower field (13 MHz) Nuclear Magnetic Resonance (NMR). This small and portable device is designed to measure the wetted surface area of nanoparticles in liquid.

Using the NMR based method, it is an incredibly versatile technique that offers many advantages, in comparison to conventional surface area techniques. The system provides superior relaxation time resolution, compared to traditionally larger and high field NMR instruments, alongside being controlled by AreaQuant software that is easy to use and requires minimal training.

NMR spectroscopy is a powerfully analytical tool used to probe details of molecular structure. As most particles are made or used as concentrated suspensions in liquids, it can provide valuable information about the strength and interaction between a liquid and particular surface functional group of a material. This particle-liquid interface controls the product performance of what the suspension is designed to be used for.

Using this instrument, the NMR liquid relaxation is designed to be uniquely sensitive to two important features of this particle-liquid interface.

Firstly, it can directly measure the wetted surface area of suspensions such as size and shape. In addition to the influence of morphology and porosity.

Secondly, liquid relaxation is sensitive to the chemical nature of a particle surface. Including the fundamental surface charge, and therefore the type and number of functional groups. Both factors would impact the wettability of a given surface.

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## **Application to nanocarbon materials**

The application of NMR liquid relaxation to nanocarbon material suspensions is a new and versatile tool for studying the probing events and interaction of particle-liquid dispersions, over a wide concentration range in almost any liquid.

Nanocarbon material formulations do pose challenges, due to the physical characterisations of suspensions, such as opaque formulations and often highly concentrated dispersions in a wide range of aqueous and non-aqueous liquids.

This technique provides major advantages for nanocarbon material suspensions. This is due to its abilities to make measurements using high concentrations ranges (0.01 to 60+%), without any dilution or required sample preparation (such as drying or degassing).

The Acorn Surface Area Analyser delivers more rapid measurements than other any surface area technique, typically <5 minutes from start to finish. Furthermore, the non-destructive technique can use small samples (typically 0.1ml, as little as 200µl), and enables samples can be easily stored and remeasured at a late date.