

# Your Partner for Advanced Material Analysis



Developing the advanced materials which gathers a lot of attentions from the industry requires various analysis.

Research and development of new materials such as ultrafine particles, photocatalyst, hybrid material, polymer gel, etc. is widely noticed for the new functionalities of those materials. Not only the production or the fabrication techniques but also the analysis and measurement technology for evaluation are important for bringing out their characteristics and high functionalities.

HORIBA contributes to the progress of the industry through supporting the research of the advanced materials, by developing the newest analytical instruments and applications.

## Nano particle characterization



Nano particle analyzer

### nano Partica SZ-100

In order to measure nanoparticles with accuracy, high-energy green laser is equipped.

## Combined analysis of AFM and Raman



### AFM-Raman

The combined system of Atomic Force Microscope (AFM) and Raman can measure the topography and Raman image for the same area.

## Particle characterization



Laser scattering particle size distribution analyzer

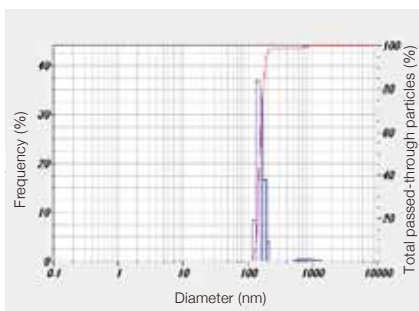
### Partica LA-960

HORIBA's revolutionary optical design provides the widest\* dynamic range (0.01-5000µm) and highest\* signal-to-noise.

(\*according to HORIBA's research in 2013)

## Application

Size distribution of nano-bubbles in water

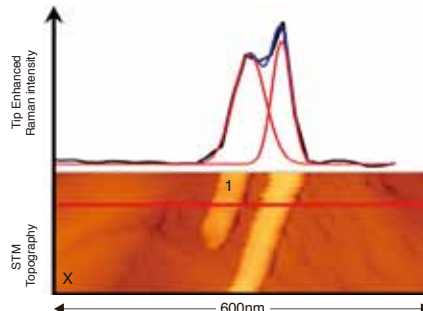


"Nano bubble water", the water containing nano bubbles is drawing attentions for their effects in washing, purification, sterilization, physiology activity, etc. The applied research in various fields, such as food, cosmetics, semiconductor and vegetable cultivation, is progressing.

It is very important to measure the particle size distribution and zeta potential of for evaluation of these various effects.

## Application

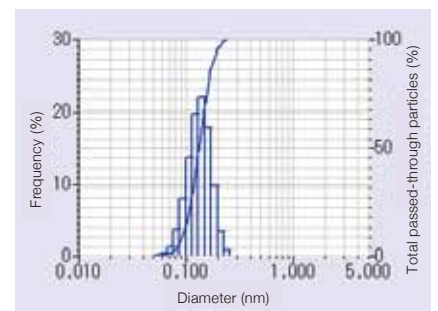
Carbon nanotubes



Carbon nanotubes on Au film was measured using AFM and TERS (Tip Enhanced Raman Spectroscopy). TERS realizes high spatial resolution of 100 nm or less.

## Application

Particle size distribution of cellulose nano fibers



Thinness, high transparency, and high strength are required for plastic film board used for flexible display etc. Nano fibers are used as combined materials for raising the strength of film without dropping transparency. .

Functional material	Evaluated parameter	Corresponding HORIBA analyzers
Intelligent polymer	Crystallinity degree	Raman microscope
	Polymer particle diameter	Particle size distribution analyzer
	Thin film thickness, anisotropy	Spectroscopic ellipsometer
Gradient functional material	Grated refractgion index	Spectroscopic ellipsometer
	Element distribution at interface	GD-OES
Organic-inorganic hybrid material	Unreacted residue verification	Raman microscope
	Diameter of particle with nano pores	Particle size distribution analyzer
	Refraction index and extinction coefficient of composite layer	Spectroscopic ellipsometer
	Constituent element distribution	GD-OES
	Microscopic elemental analysis	SEM-EDX
Nano-composite	Elemental microanalysis	ICP-OES
	Particle size and degree of dispersion	Particle size distribution analyzer
	Principal component analysis, elemental microanalysis	X-ray fluorescence analyzer
Fine ceramics	Elemental microanalysis	ICP-OES
	Particle size nad degree of dispersion	Particle size distribution analyzer
	Crystallinity degree, polymorphism, stress	Raman microscope
	Constituent element distribution	GD-OES
Carbon nano tube	Principal component analysis, elemental microanalysis	X-ray fluorescence analyzer
	Crystallinity degree, chirality, diameter	Raman microscope
	Chirality	Fluorescence Spectroscopy
	Particle size, degree of dispersion	Particle size distribution analyzer
	Film thickness, refraction index, extinction coefficient	Spectroscopic ellipsometer
	Distribution of supported metal particles	SEM-EDX

**Structure analysis of carbon materials**

**Thin-film measurement**

**Elemental depth profiling**



Raman microscope  
LabRAM HR Evolution

The Raman spectrum at near 10 cm<sup>-1</sup> low wave number can be measured by using ultra low frequency raman module option.



Spectroscopic ellipsometer  
UVISEL2

UVISEL 2 delivers the highest level of performance for nano and micro layer characterization.

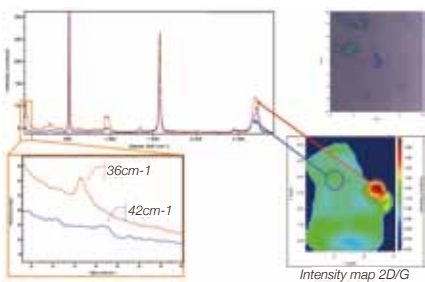


RF Glow Discharge Optical Emission Spectrometer (GD-OES)  
GD-Profiler2

GD-OES can be utilized in research, development, and film evaluation of plating, heat treatment, surface treatment, surface coating, etc.

**Application**

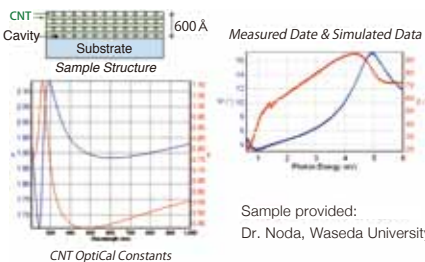
**Graphene**



As for multilayer graphene, peaks position changes according to a number of layers. Although conventionally checked by the intensity ratio of 2D and G band, a number of layers can be checked at around 40 cm<sup>-1</sup> wave number (share mode) by using Ultra low frequency Raman module.

**Application**

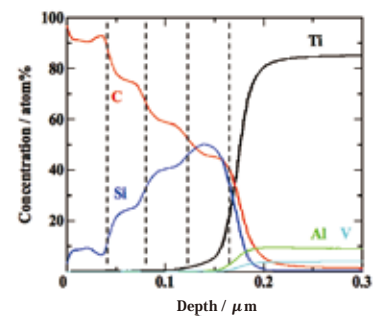
**CNT network structure**



For Non-destructive and non-contact characterization, Ellipsometer enable users to measure film thickness, optical constants and many other material properties of CNT network structure.

**Application**

**Analysis of C/Si gradient film on Ti Alloy**



The adhesion characteristics, wear resistance and strength of the gradient film can be changed by changing the ratio of composing element in depth profile. GD-OES makes it possible to evaluate complicated film structure for a short time.

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