**Quick and High Performance Surface Observation Equipments**

**Purpose:**
It is sometimes necessary to observe and analyze very quickly quite a few specimens obtained from drilling samples or so for research activities such as geological CO2 storage projects and assessment of active faults. Some specimens should be analyzed without any pre-treatments such as carbon coating. The equipments are suitable for quick observation and elemental analysis for solid surfaces at the micro level without requiring any pre-treatments.

**Main Specifications:**
1) Surface observation and elemental analysis with magnification of 100 - 10,000 by environmental scanning microscope (ESEM) and energy dispersive spectroscopy (EDS) x-ray microanalyzer.
2) Surface observation with 3D imaging and shape measurement under magnification of 100 - 10,000 by laser microscopy.

**Principal Features:**
1) Compact-size ESEM (Keyence© VE-7800) equipped with EDS x-ray microanalyzer (EDAX© Genesis2000) 
   Ready for sample analysis in just 10 minutes after setting a sample to a sample holder
   Sophisticated surface observation and elemental analysis without carbon coating
   Surface observation and elemental analysis under magnification of 100,000 with carbon coating
2) Laser microscopy (Keyence© VK-8500) with image connection software (Mitani© Virtual View3D) 
   Sophisticated surface observation, 3D imaging and shape measurement without any pre-treatments
   Shape measurement with resolution of 0.01 μm
   Seamless 3D images with image connection technology

**Location and Date of Installation**
Abiko Campus, December 2004

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**Isotope ratio Mass Spectrometer for Hydrogen and Oxygen**

**Purpose:** Isotope ratio of hydrogen and oxygen of water can provide important information on movement of water. Movement of groundwater can be supposed using profile of isotope ratio of hydrogen and oxygen. Furthermore, high concentrated HDO can be a tracer of water even for the water in rock-pore or layer structure of clay minerals. Thus, measurement of isotope ratio of hydrogen and oxygen of water is required.

**Main Specifications:**
1) Autosampler
   An autosampler is fitted with mass spectrometer, and that provides up to 110 sample capacity. Samples are introduced to pre-treatment system automatically.
2) Sample preparation system
   A continuous flow sample preparation system is also fitted with mass spectrometer delivering the best speciation for measurement of isotope ratio (CO for oxygen and H₂ for hydrogen).
3) Mass spectrometer
   Using magnetic field and electro static filter, (H₂ and HD) or (C¹⁶O and C¹⁸O) are separated and isotope ratio can be estimated. Uncertainty of measurement is within 0.1‰ in each measurement.

**Location and Date of Installation**
Abiko Campus, November 2004