


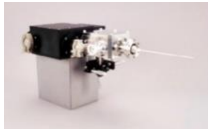










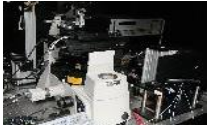







List of Facilities

Device name	Equipment Overview	
High-Density Atmospheric Pressure Plasma Equipment (Fuji Machinery Manufacturing Co., Ltd.)	Surface treatment (modification, cleaning) of materials using radicals in atmospheric pressure plasma. Process gas: Ar, N ₂ , Ar+O ₂ . Power supply: AC power supply, 9 kV, 60 Hz.	
High-Density Liquid Plasma Equipment (NU System Co.)	Synthesis of nanographene using organic solvents. Enables liquid analysis and cell modification. Power supply: 9 kV, 60 Hz. Liquid: Alcohols, 500 mL. Process gas: Ar, 3 L/min.	
Atmospheric Pressure IAMS (Ion Attachment Mass Spectrometer) (Canon Anelva Co.)	Atmospheric pressure plasma mass analysis is possible. Detected mass number: 1-410.	
Ultraviolet Absorption Spectrophotometer (Actinic Monitors) (NU System Co.)	Plasma diagnosis, installed on the wall of the vacuum chamber. H, O, N, C radical density measurement is possible.	
In-situ Electron Spin Resonance (ESR) (Bruker Corporation)	Real-time measurement of unpaired electrons in samples, temperature cannot be varied (room temperature), gas analysis possible Sample size: 5 mm width or less, quartz tube, gas analysis possible	
Multi-Gas Plasma Process Equipment for Radical Measurement (NUI Eco-Engineering Co.)	In-situ temperature, radical density, excited species, and surface analysis are performed during etching using substrate temperature, radical, multi-spectrometer, and FTIR. Substrate temperature: -10°C to 60°C Process gases: H ₂ , N ₂ , Ar, O ₂ , CF ₄ , C ₄ F ₈ , SF ₆ , He	
Plasma-Assisted Ion Implantation System	It is possible to deposit films in atomic layers using plasma, and it is possible to evaluate the film quality during film formation using in-situ FTIR. Substrate temperature: 20-600°C. Process gases: SiH ₄ , Ar, N ₂ , H ₂ , O ₂ .	
High-Temperature Process Compatible Plasma Matching System	In plasma etching based on Cl ₂ or BCl ₃ , high-temperature etching processes are possible. Substrate temperature: 200-600°C. Process gases: Cl ₂ , Ar, N ₂ , BCl ₃ , O ₂ .	
Surface Analysis Plasma Beam Equipment	By irradiating the plasma beam onto the material surface and evaluating it using in-situ XPS, it is possible to analyze the reaction between the surface and the plasma. Process gases: HBr, Ar, CF ₄ , C ₄ F ₈ , Cl ₂ , H ₂ , N ₂ , O ₂ .	
Desktop Electron Microscope (Hitachi High-Technologies Corporation)	Cold FE SEM, semi-in-lens secondary electron detector, backscattered electron detector, EDS, EBSD.	

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Atmospheric Pressure Plasma Equipment (Fuji Machinery Manufacturing Co., Ltd.)	By treating the material surface with atmospheric pressure plasma, it is possible to achieve good bonding between different materials without the use of bonding pre-treatment agents (primers).	
Grinder (IKEGAI Co., Ltd.)	It is possible to cut the cross-section of the observation sample at a speed approximately 100 times faster than hand polishing, without embedding. The weight of the sample holder can be reduced, enabling delicate polishing.	
Ion Milling Equipment (Hitachi High-Technologies Corporation)	By cooling the sample to -30°C or below during cross-section cutting, it is possible to prepare cross-section observation samples with minimal damage, even for materials such as solder and resin that are susceptible to heat damage.	
NLD Dry Etching Equipment (ULVAC Inc.)	Low-pressure, low-electron temperature, high-density plasma dry etching is possible using a neutral line plasma (NLD). Process gases: Ar, O ₂ , CF ₄ , C ₄ F ₈ .	
Coherent Anti-Stokes Raman Scattering (CARS)	Live cell imaging is possible by resonantly exciting multiple vibration modes known as multiplex CARS.	
Ion Chromatograph (SHIMADZU Corporation)	It is possible to detect ion components in liquid samples.	
Scanning Tunneling Microscope (STM) / Atomic Force Microscope (AFM) (JEOL Ltd.)	By using a vacuum retention transfer system in combination, it is possible to observe the surface of plasma-treated surfaces without being affected by atmospheric pollution.	
Quadrupole Mass Spectrometer (Hiden Analytical Ltd.)	It is possible to detect ion species, radical species, etc. in the plasma.	
In-situ FTIR for Atmospheric Pressure	Monitoring surface modifications during atmospheric pressure plasma processing is possible.	
Shuler Apparatus (KATO KOKEN Co., Ltd.)	Air flow and density distribution inside objects can be visualized.	

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Quadrupole Mass Spectrometer (Pfeiffer Vacuum GmbH)	Ion species and radical species in the plasma can be detected.	
Liquid Plasma Treatment System	Material synthesis and liquid reforming by high-speed plasma treatment of large quantities of liquid (up to 20 liters) is possible.	
Remote Electrostatic Precipitator EC-2000 (Sanyo Air Filter Manufacturing Co., Ltd.)	Large centrifugal concentrator with digital timer and digital temperature control, vacuum concentration of four 96-well deep wells is possible.	