ARISTOTLE
UNIVERSITY
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RESEARCH
COMMITTEE

# ADVANCED MATERIALS AND DEVICES LABORATORY (AMDE LAB)

The scope of Advanced Materials and Devices Laboratory (AMDe Lab), of the School of Physics AUTh, is the development and research of high-tech activities, the collaboration with research centers and academic institutions, and the organization of lectures and scientific events.

The research objectives of AMDe Lab are:

1. Formation and synthesis of high-tech materials.
2. Structural and chemical state characterization using X-ray methods.
3. Optical Properties and Spectroscopy.
4. Thermal analysis.
5. Morphological characterization and elemental analysis of materials and surfaces.

## Advanced Materials and Devices Laboratory (AMDE LAB)

AMDe lab
LABORATORY OF ADVANCED
MATERIALS AND DEVICES

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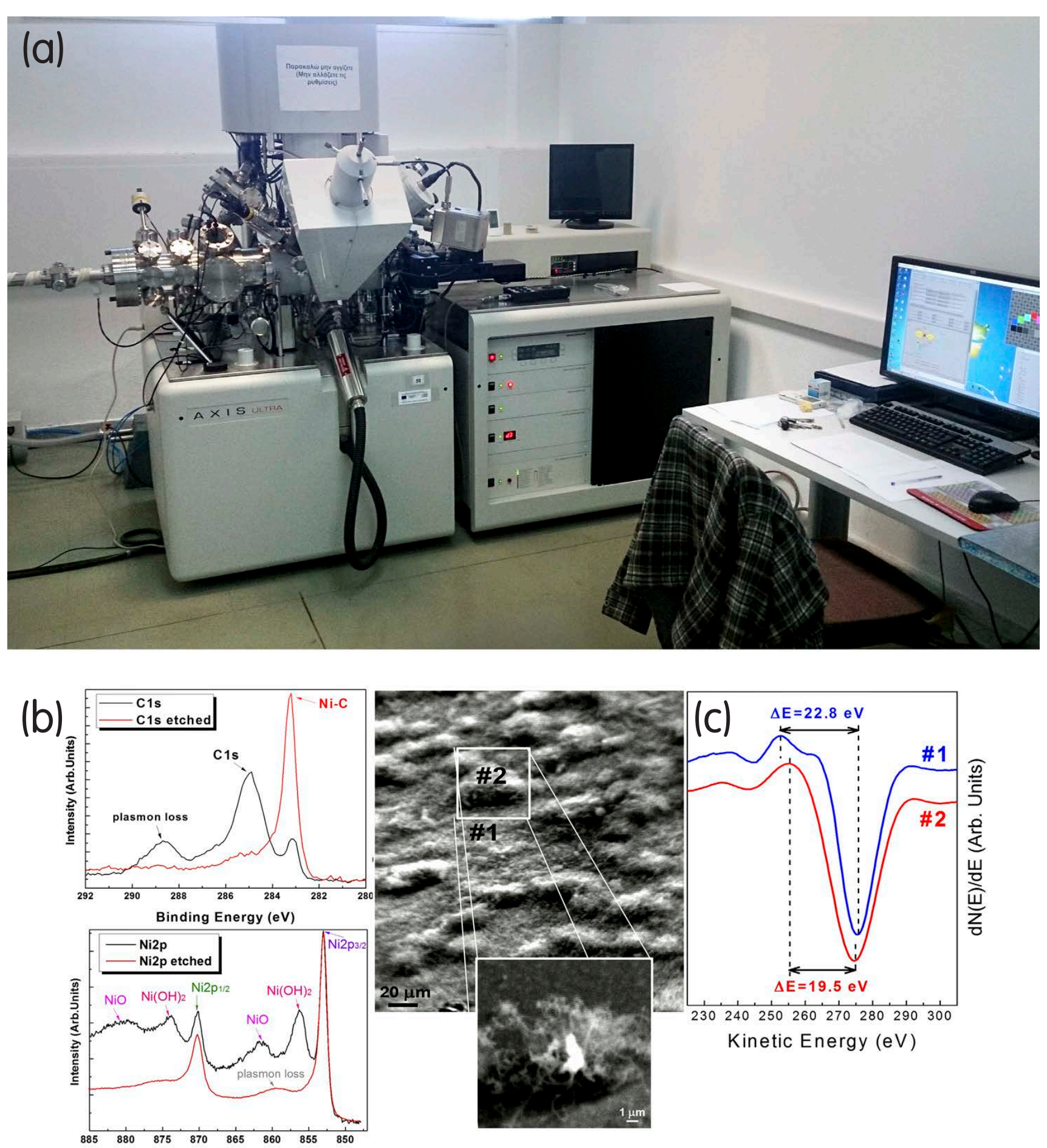

Figure 1: (a) View of the X-ray Photoelectron (XPS) and Scanning Auger Microscopy and Spectroscopy System (SAM/AES) housed in the AMDe lab. (b) HR XPS measurements of nanocomposite catalysis of DLC: Ni for the growth of CNTs before and after the Ar Ion etching of the surface. (c) FEG AES measurements and quality tests of CNTs on two different spots as shown in the SAM images. Spot #1 indicates an excellent quality of CNTs because of the nano-scale Ni particles as substrate for the growth of CNTs. Spot #2, on the other hand, shows bad quality CNTs.

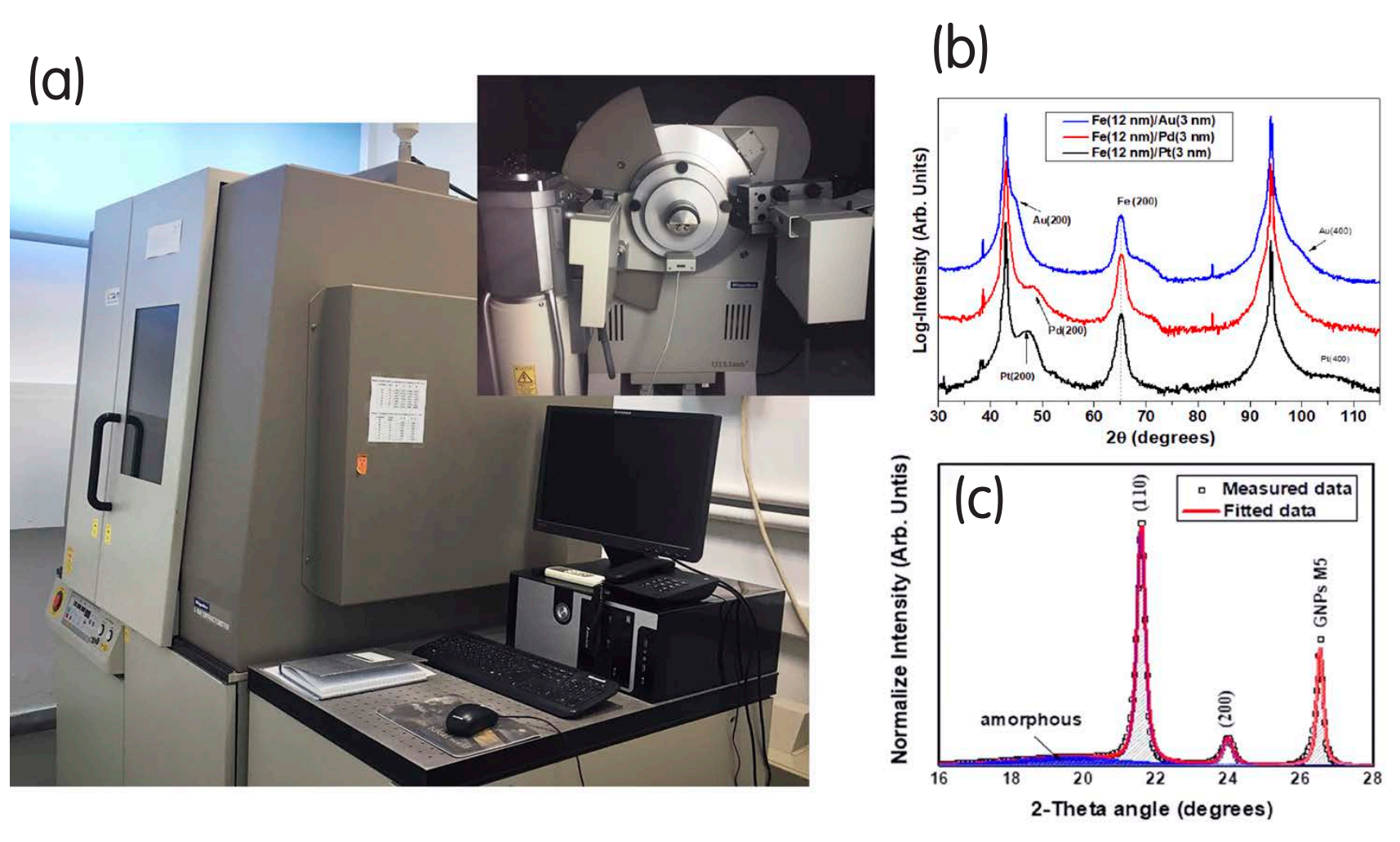

Figure 2: (a) A 2 cycles Rigaku Ultima diffractometer equipped with a Cu X-ray beam source operating at Bragg-Brentano and Grazing Incidence (GIXRD) geometry. (b) HR diffracted peaks from epitaxial Fe/Au, Fe/Pd and Fe/Pt ultra-thin films grown on MgO substrates. (c) Diffraction patterns of polymers with modeling of the experimental data.

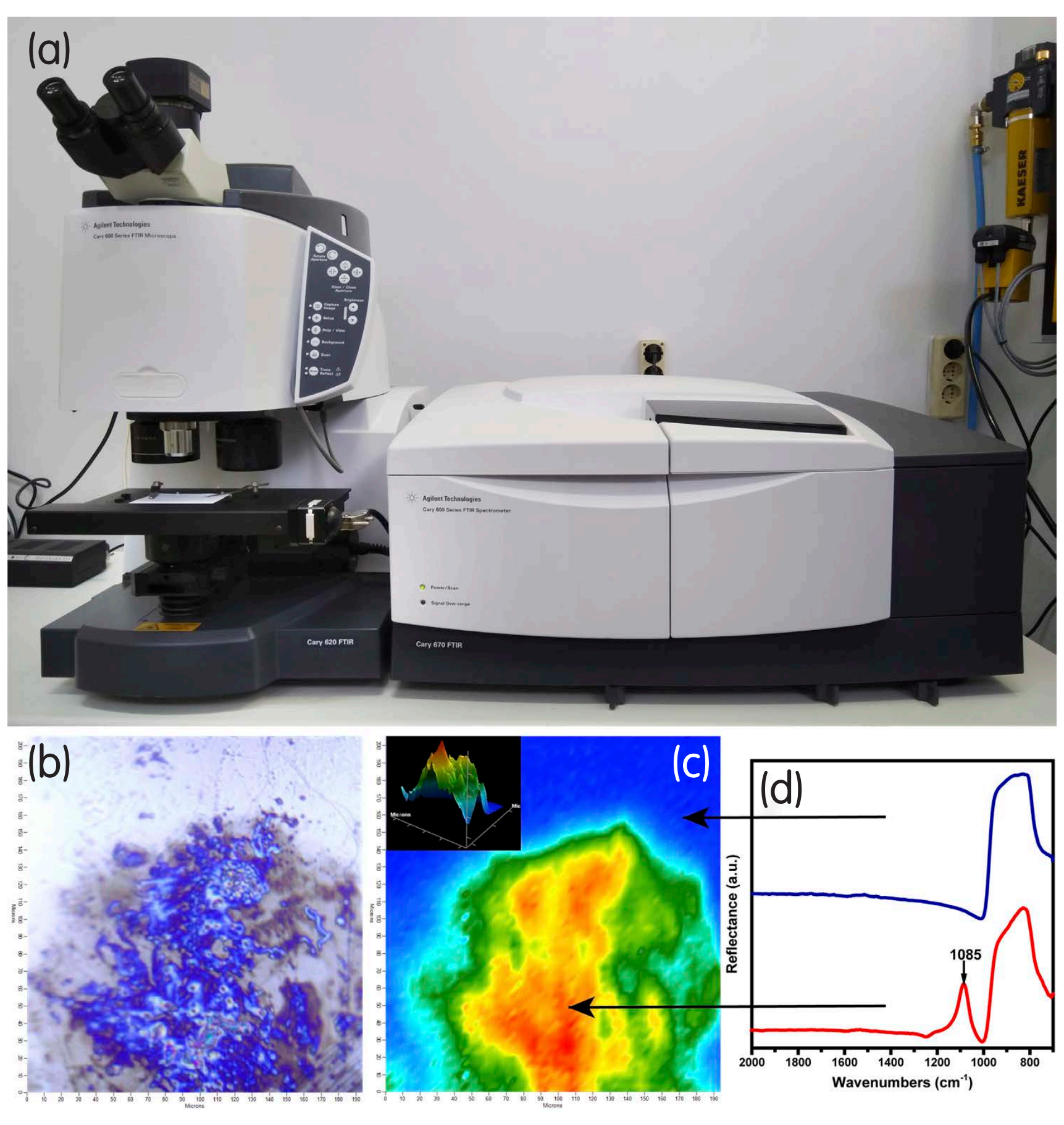

Figure 3: (a) Agilent Cary 670 Fourier Transform Infrared (FTIR) spectrometer (spectral range 6000 - 100 cm$^{-1}$) connected with a Cary 620 FTIR microscope, equipped with a Focal Plane Array detector (FPA), used for the molecular investigation and characterization of materials. (b) Microscopic image of a SiC surface including unknown superficial spots. (c) FPA chemical images using integrated area under Si-O band (1085 cm$^{-1}$) (4096 spectra collected from a 200X200 μm area with 32 scans, in less than 4 minutes). (d) Corresponding FTIR spectra of the SiC surface and the SiO$_2$ spots, the latter as an oxidation product.

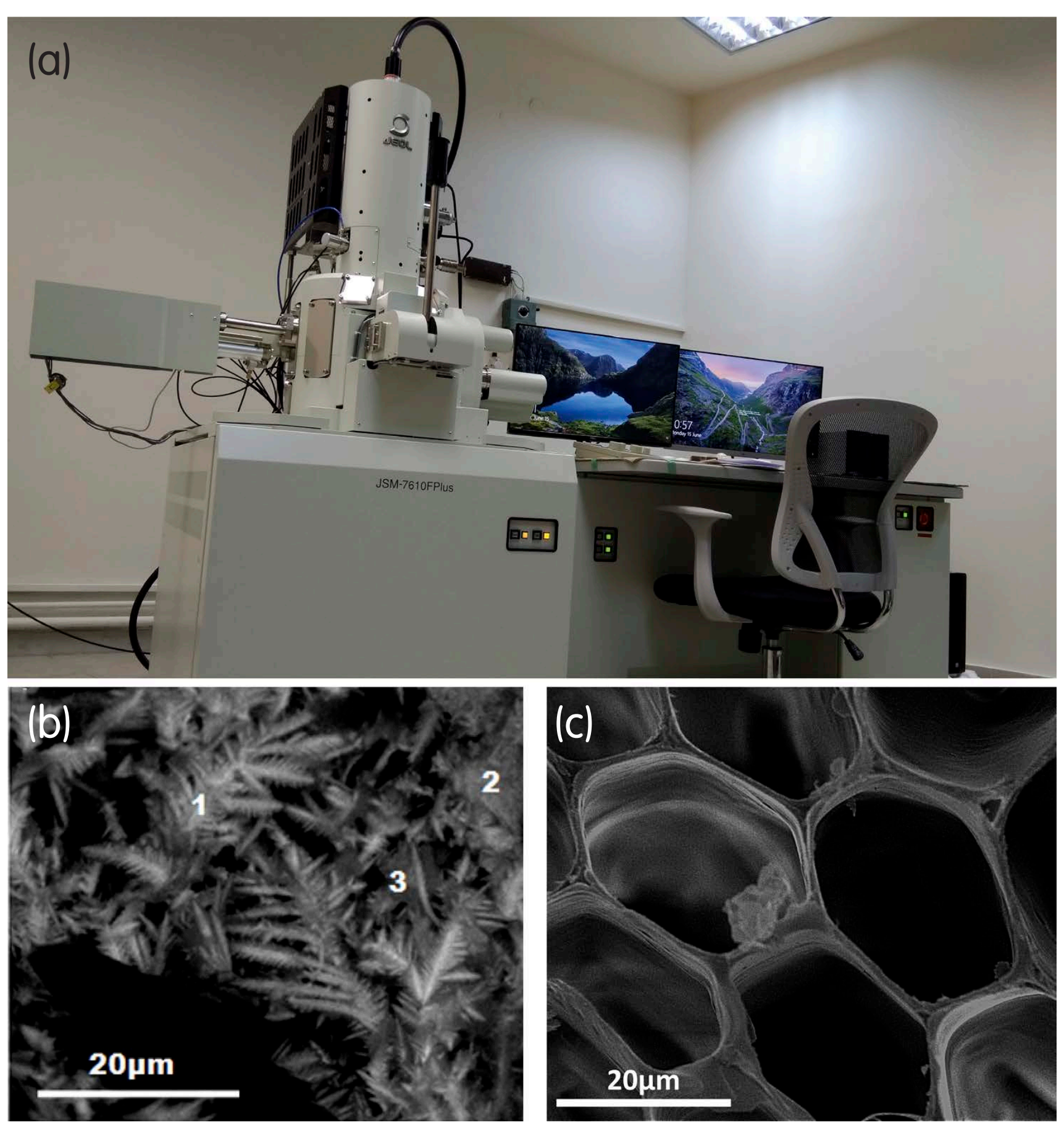

Figure 4: (a) A JEOL JSM-7610FPlus Schottky Field Emission Scanning Electron Microscope (SEM) coupled with Energy Dispersive X-Ray (EDX) microanalysis. The method provides chemical and structural analysis of specimens as well as topographical imaging of the surface. High-resolution SEM images of the morphology of dendrite (b) and hemp stem (c) specimens.

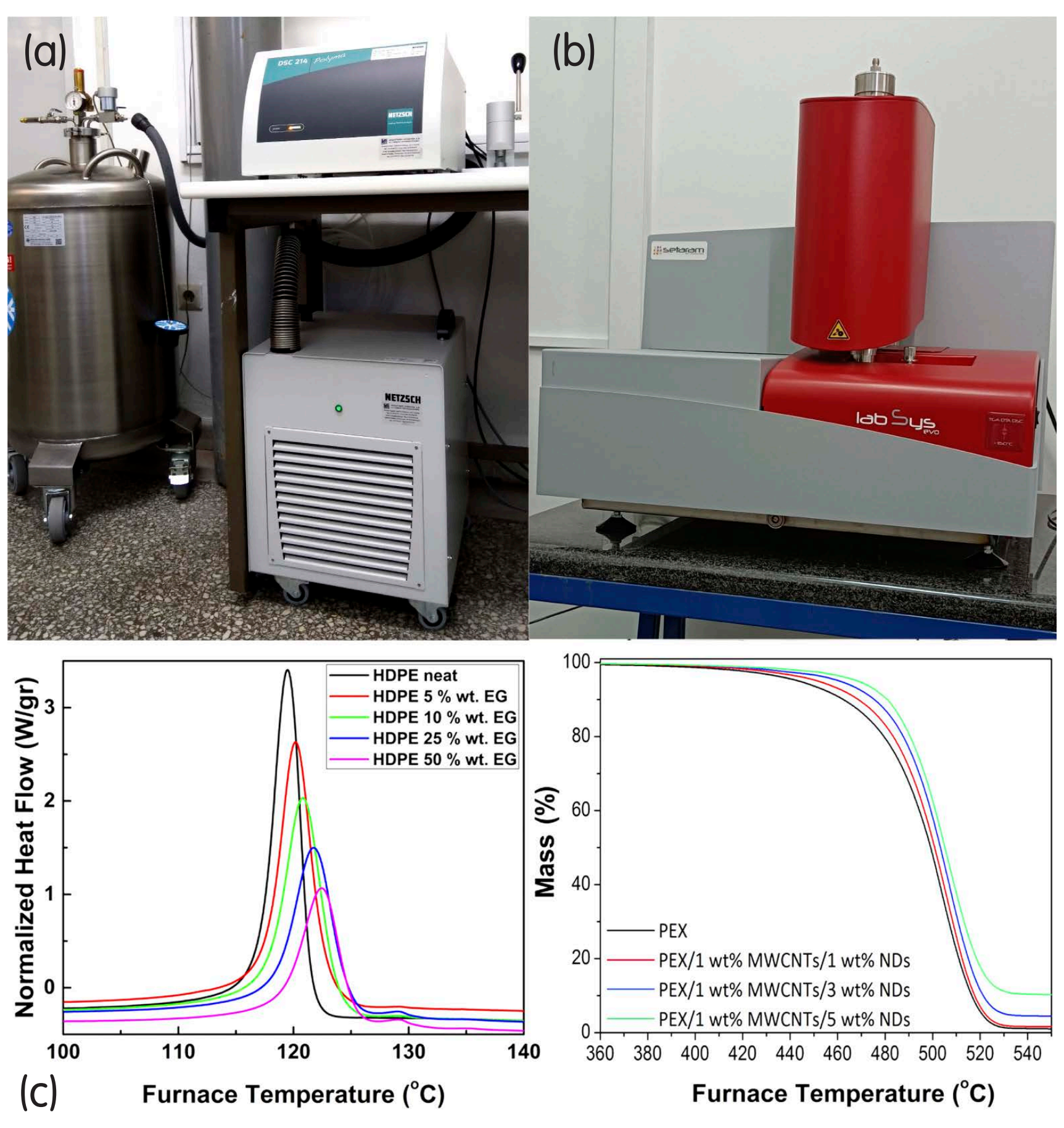

Figure 5: (a) NETZSCH Differential Scanning Calorimeter (DSC 214 Polyma) used for the determination of the energy limits of materials in physicochemical processes. (b) Thermogravimetric and Differential Thermal Analyses (TGA) are conducted by SETARAM LABSYS EVO 1150, used for the identification of phase transformations by temperature fluctuations and prediction of oxidation resistance. (c) Heat flow and mass degradation dependence on temperature for various polymer nanocomposites.

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