

Table 1 Analysis items and evaluation details of the fuel debris sample^{1*}

1. Grasping the condition of the sampled area

Analysis items	Analysis methods	Evaluation details	Examples of major applications for decommissioning
Basic information • External appearance, weight • Dose rate • Density distribution	• Exterior, weight, dose rate measurement • Imaging plate • X-ray computed tomography	Organization of basic information	Basic information to review retrieval (existence and mount of pores, etc.)
Element content (elemental composition)	• Inductively coupled plasma mass spectrometry • Inductively coupled plasma atomic emission spectroscopy	Content of fuel components Origin of major components	Basic information to review safety measures at retrieval, such as criticality evaluation, and storage methods
Isotope ratio	• Thermal ionization mass spectrometry • Secondary ion mass spectrometry	U isotope ratio	
Element and compound distribution	• Scanning electron microscope-energy dispersive X-ray spectroscopy • Scanning electron microscope-wavelength dispersive X-ray spectroscopy • Transmission electron microscope-energy dispersive X-ray spectroscopy	Evaluation of distribution of elements and compounds (including pores)	Basic information to review retrieval methods and tools (estimation of hardness, toughness, etc.)
Radioactive concentration	• Gamma-ray spectrometry • Alpha-ray spectrometry	Accompanied condition of U with focal nuclides	Information to review technology development for non-destructive measurement at fuel debris retrieval

2. Estimation of formation process of fuel debris

Analysis items	Analysis methods	Evaluation details	Examples of major applications for decommissioning
Crystal structure and composition of phases including U	• Scanning electron microscope-energy dispersive X-ray spectroscopy • Scanning electron microscope-wavelength dispersive X-ray spectroscopy • Transmission electron microscope-energy dispersive X-ray spectroscopy • Micro Raman spectroscopy • Micro-X-ray absorption fine structure spectroscopy • Micro-X-ray fluorescence spectroscopy • Micro-X-ray diffraction analysis	Estimation of temperature and atmosphere when U particles, etc. are formed Oxidation state of U, etc.	Precise estimated drawing of the condition inside the core to review retrieval methods and internal investigation

*Abbreviations of analysis methods in the cited source have been spelled out to the official terms.