During the accident at the TEPCO’s Fukushima Daiichi NPS (1F), the reactor cores reached very high temperatures and the fuels were molten, resulting in a severe accident. Decommissioning of the power stations, including removal of the molten fuels (debris) is underway. Information on the properties of the debris is important for analyzing the progress of the accident, estimating the status inside the damaged reactors, and developing a plan for debris removal.

The most extensive examinations and analyses were conducted on debris sampled from the reactor core of Three Mile Island Unit 2 (TMI-2) after the accident in 1979. We obtained approximately 60 pieces of TMI-2 debris and conducted appearance observation, density measurement, microstructure observation and chemical analysis. In addition, thermal properties, including the thermal expansion, specific heat capacity, thermal diffusivity, and melting temperature, were measured. Simulated debris that had a similar chemical composition to that of the TMI-2 debris was also used in the measurements.

Fig.1-37 shows the appearance and microstructure of two typical types of debris. The VIP-11A contains relatively large amounts of metallic components originating from stainless steel, Inconel and Zircaloy, whereas VIP-12A is ceramic debris that mainly consists of oxides of uranium and zirconium.

![VIP-11A](image1.png)

![VIP-12A](image2.png)

**Fig.1-37 Molten fuels from Three Mile Island Unit 2**
Appearance and microstructure of two typical types of molten fuels (debris). VIP-11A contains relatively large amounts of metallic components originating from stainless steel, Inconel and Zircaloy, whereas VIP-12A is ceramic debris that mainly consists of oxides of uranium and zirconium.

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