

## 疲労試験を行ったTiAl-Nb金属間化合物のTEM観察 TEM Observations of Fatigued TiAl-Nb Intermetallic Compounds

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### 【Introduction】

TiAl intermetallic compounds have specific applications depending their properties, such is the case of applied compound as low-pressure turbine blade of the aircraft engine. When applying an aircraft engine, it is necessary to elucidate the fatigue characteristics at environmental temperatures. Purpose of this study is clarifying the fatigue fracture mechanism in TiAl, based on the SEM observations of fractured surfaces and TEM observations of dislocation structures in adjacent the fracture surface.

### 【Experimental】

Isothermally forged Ti-46at%Al-5.0at%Nb was prepared for fatigue test specimens. Fatigue life experiments were carried out at various stress amplitude at 650°C and ambient temperatures. After fatigue life test, fracture surfaces were observed by SEM. A thin foil of deformed specimen presented fractures on 8897 cycle after 593 minutes, determined specimen was fabricated from the tissue near the breakdown using focused ion beam (FIB). TEM observations were carried out using JEM2000FX operating at 200keV.

### 【Results】

At the moment of the analysis of specimen composed by TiAl-Nb at 650°C, it can be observed serration spacing is 2.5 μm on the fatigue fractured surface frequently (Fig.1). These observations are similar to fatigued fracture of conventional metal. In Fig.2, deformation twins were observed with 100 nm spacing. Twin deformation frequently operated during fatigue test. Figure 3 show the high dislocation density region with dislocation tangling near the low dislocation density region. These observed dislocation structures would be corresponding to the ladder structure of the conventional fatigued metal specimen.

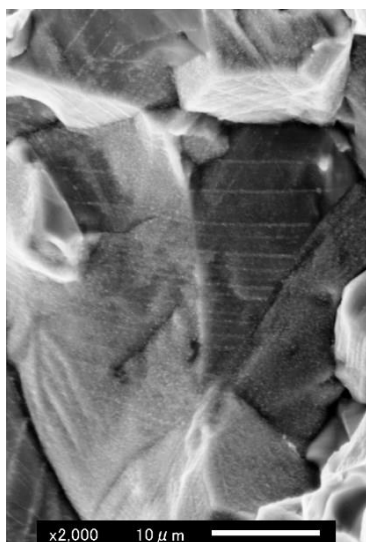


Fig.1 Serration appeared on intergranular fracture surface

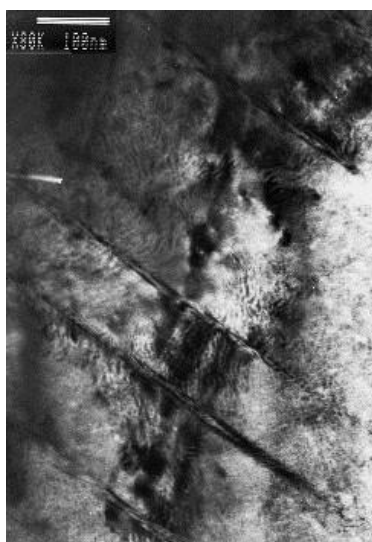


Fig.2 Deformation twins operated at the vicinity of fracture surface

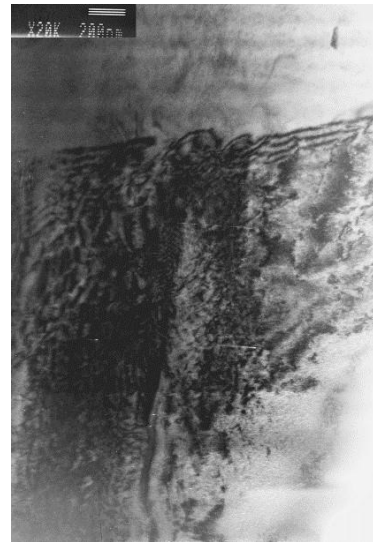


Fig.3 High and low dislocation density regions in fatigued specimen