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## m{1-100}面 KOH エッチング及びカソードルミネセンスによる 4H-SiC 単結晶積層欠陥の評価

Evaluation of stacking faults in 4H-SiC single crystal by using KOH etching on non-polar {1-100} face and cathodoluminescence

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We have studied the feasibility of acquiring the information about stacking fault (SF) density, SF types and their changes along *c*-axis growth direction, by using  $\{1-100\}$  face molten KOH etching and cathodoluminescence (CL) imaging.

Fig. 1 shows the optical image of the  $\{1-100\}$  surface etched by molten KOH at 510 °C for 4 min. Two types of etch figures have been found. Pyramidal etch pits are attributed to dislocations that intersect with the (1-100) surface. Step-like etch figures (referred to as "linear etch pattern" henceforth) extending in <11-20> direction are found to be related to stacking faults. In contrast to former

results reported by other groups <sup>1,2)</sup>, the etch figure of SFs in our study is elevation rather than depression, which is composed of a rising slope of {1-10-n} and a nearly perpendicular terrace of (0001) Si-face, as depicted in the inset of Fig. 1. A one-to-one correlation has been confirmed between the linear etch patterns and SF-related CL bright lines observed in CL image (not shown). Fig. 2(a) present the position-dependent CL spectra, taken along the dotted line for 41 points, crossing four linear etch patterns A–D; SF-related CL

have been observed right at the vertex of each linear etch pattern (Fig. 2(b)), and their CL peaks provide the information of SF type, i.e., the local stacking sequence. Transmission electron microscopy (TEM) has been employed to clarify the location of SFs with respect to the KOH-etched linear etch patterns and atomic arrangement of SFs. It has been found that multiple SFs could exist beneath the {1-10-n} slope of a single linear etch pattern. Among these SFs, the one closest to the (0001) Si-face surface aligns with the vertex of the linear etch pattern. A model of linear etch pattern formation at SFs by KOH etching will be proposed.

Reference: 1) J. Takahashi *et al.* J. Cryst. Growth 167 (1996) 596. 2) J. Takahashi *et al.* J. Cryst. Growth 181 (1997) 229.



Fig. 1 Optical image of the molten-KOH-etched non-polar (1-100) face.



Fig. 2 Position-dependent CL spectra; (b) CL intensity image; (c) CL spectra at A–D.