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ETCHPITS AND DISLOCATIONS ALONG GRAIN BOUNDARIES, SLIPLINES AND POLYGONIZATION WALLS*

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This paper describes some preliminary results of a study of the distribution of dislocations in crystals of rock salt by means of the etching process. It is shown that a one to one relation can be established between dislocations and etchpits. This applies as well to dislocations in small angle grain boundaries, as to dislocations produced by slip. Both Taylor and Burgers dislocations etch. In particular, formulae for the dislocation density in asymmetrical pure tilt boundaries are verified. The mixed character (tilt and twist) of a particular boundary could be visualized.

It was further shown that etchpits are produced along slip traces, visible as well as invisible ones.

LES FIGURES D'ATTAQUE ET LES DISLOCATIONS LE LONG DES JOINTS INTERCRISTALLINS, LES LIGNES DE GLISSEMENT ET LES PAROIS DE POLYGONISATION

On décrit dans cet article quelques résultats préliminaires d'une étude de la distribution de dislocations dans des cristaux de sel gemme au moyen du processus d'attaque. On montre qu'il est possible d'établir une relation directe, d'unité pour unité, entre les dislocations et les figures d'attaque. Ceci s'applique aussi bien aux dislocations dans des joints intercristallins à petit angle qu'aux dislocations produites par glissement. Les deux types de dislocations (de Taylor et de Burgers) apparaissent sous l'attaque. Il a été possible, en particulier, de vérifier des formules donnant la densité des dislocations dans des joints asymétriques qui résultent d'une inclinaison simple entre les deux cristaux. Le caractère mixte d'un joints résultant d'une inclinaison et d'une rotation des cristaux a pu être représenté.

ÄTZGRUBEN UND VERSETZUNGEN AN KORNGRENZEN, GLEITLINIEN UND POLYGONISATIONSGRENZEN

Die vorliegende Arbeit beschreibt einige vorläufige Ergebnisse einer Untersuchung von Versetzungen in Steinsalzkristallen mit Hilfe einer Ätztechnik. Es zeigt sich, dass eine direkte Beziehung zwischen Versetzungen und Ätzgruben nachgewiesen werden kann, und zwar sowohl für Versetzungen in Kleinwinkelkorngrenzen als auch für Versetzungen, die im Gleitprozess erzeugt wurden. Sowohl Taylor-als auch Burgersversetzungen lassen sich ätzen. Es wurden speziell die Formeln der Versetzungsdichte in asymmetrischen reinen Neigungskorngrenzen experimentell verifiziert. Die verschiedenen Komponenten (Neigungs-und Verwerfungskomponenten) einer bestimmten Korngrenze konnten auf diese Weise deutlich gemacht werden.

Weiterhin wurde gezeigt, dass sowohl auf sichtbaren als auch auf unsichtbaren Gleitspuren Ätzgruben entstehen.

Introduction

In the course of a study of the etching process—mainly of rock salt—some results were obtained which permit the conclusion that a one-to-one relationship was established between etchpits and dislocations. The dislocations were of both types (Taylor and Burgers); they were either initially present in the crystal (in sub-boundaries) or created by deformation. We give here some preliminary results. (The detailed account has to be reserved for publication as part of a thesis at Ghent University.)

Experimental Procedures

Fresh cleavage faces of "single" crystals of rock salt grown from the melt were etched with alcohol, then washed in ether, and rapidly dried on filter paper. In the described way, small well-developed polygonal etchpits could be obtained in a reproducible way. Their polygonal shape was used at the same time to orient the specimen.

Three kinds of specimens were investigated:

(*a*) Well-annealed specimens. A substructure of small angle boundaries, similar to the veining structure of annealed aluminium single crystals [1], was found. A great number of the boundaries could be resolved into separated etchpits.

(*b*) Specimens deformed by compression. Separated etchpits were developed along the slip traces.

(*c*) Bent and annealed specimens. Dislocation walls, due to polygonization, could be visualized by means of etchpits.

Observations

We will now summarize some of the results which were obtained.

(a) *Sub-boundaries*

The cleavage faces were found to consist of slightly disoriented crystal grains. This could be shown by means of the interference method introduced by Françon [2]. This method shows small orientation differences as differences in colour.

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