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**Fine ceramics (advanced ceramics,  
advanced technical ceramics) —  
Test method for GaN crystal surface  
defects —**

**Part 1:  
Classification of defects**

*Céramiques techniques — Méthode d'essai pour les défauts de surface  
des cristaux de GaN —*

*Partie 1: Classification des défauts*

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Published in Switzerland

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## Foreword

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This document was prepared by Technical Committee ISO/TC 206, *Fine ceramics*.

A list of all parts in the ISO 5618 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

GaN is a direct transition type of wide-bandgap semiconductor with superior physical properties, including a higher breakdown electric field, saturated electron drift velocity and thermal conductivity, to Si. GaN is expected to be applied not only in light-emitting devices that have been in practical use for a long time, such as ultraviolet and blue laser diodes (LDs) and light-emitting diodes (LEDs), but also in power devices for high-efficiency power conversion. In particular, the characteristics of GaN-based power devices are applied in the fields of photovoltaics, automobiles, railways (electric motors and linear motors), communication base stations and microwave power transmission.

The single-crystal GaN substrate or single-crystal GaN film is the base material used to produce devices. However, the surface of a single-crystal GaN substrate or single-crystal GaN film contains many dislocations that are introduced during crystal growth and defects that are introduced during wafer processing. The dislocations and/or defects cause a decrease in luminous efficiency for a light-emitting device and a degradation in performance and reliability for a power device. In particular, given the practical applications and market expansion of power devices that apply a high voltage and high current, it is important to supply single-crystal GaN substrates and single-crystal GaN films with low densities of dislocation and defects. Therefore, it is essential to have an International Standard that defines and classifies the types of, and further determines the density of, dislocations and process-induced defects that exist on the surface as an index for assessing the quality of a single-crystal GaN substrate or single-crystal GaN film.

This document gives a classification of the dislocations and process-induced defects exposed on the surface of single-crystal GaN substrates and single-crystal GaN films. These single-crystal substrates and films are mainly used for light-emitting devices, such as LDs and LEDs, and power devices that perform high-voltage and high-current power conversion. ISO 5618-2<sup>1)</sup> provides a method of determining the etch pit density.

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1) Under preparation. Stage at the time of publication: ISO/DIS 5618-2:2023.

