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**Nuclear fuel technology — Sintered  
(U,Pu)O<sub>2</sub> pellets — Guidance for  
ceramographic preparation for  
microstructure examination**

*Technologie du combustible nucléaire — Pastilles (U,Pu)O<sub>2</sub> frittées  
— Préconisations relatives à la préparation céramographique pour  
examen de la microstructure*

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# Contents

	Page
Foreword .....	iv
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Principle .....</b>	<b>1</b>
<b>5 Description .....</b>	<b>2</b>
<b>6 Equipment .....</b>	<b>2</b>
<b>7 Reagents and resin .....</b>	<b>2</b>
<b>8 Operating procedure .....</b>	<b>3</b>
8.1 Specimen cutting .....	3
8.2 Resin embedding .....	3
8.3 Rough polishing .....	3
8.4 Final polishing .....	3
<b>9 Structure development .....</b>	<b>4</b>
9.1 General .....	4
9.2 Development by thermal treatment .....	4
9.3 Development by chemical etching .....	4
9.4 Development by ion etching .....	5
<b>Bibliography .....</b>	<b>7</b>

## Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. [www.iso.org/directives](http://www.iso.org/directives)

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The committee responsible for this document is ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 5, *Nuclear installations, processes and technologies*.

# Nuclear fuel technology — Sintered (U,Pu)O<sub>2</sub> pellets — Guidance for ceramographic preparation for microstructure examination

## 1 Scope

This document describes the ceramographic procedure used to prepare sintered (U,Pu)O<sub>2</sub> pellets for qualitative and quantitative examination of the pellet microstructure.

The examinations are performed before and after thermal treatment or chemical etching.

They allow

- observation of any cracks, intra- and intergranular pores or inclusions, and
- measurement of the grain size, porosity and plutonium homogeneity distribution.

The mean grain diameter is measured by one of the classic methods: counting (intercept method), comparison with standard grids or typical images, etc.<sup>[2]</sup> The measurement of individual grain sizes requires uniform development of the microstructure over the entire specimen.

The plutonium cluster and pore distribution and localization are generally analysed by automatic image analysis systems. The plutonium distribution is usually revealed by chemical etching but alpha-autoradiography can also be used. The first technique avoids the tendency for autoradiography to exaggerate the size of plutonium-rich clusters due to the distance the alpha particles travel away from the source.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

## 4 Principle

The ceramographic preparation of (U,Pu)O<sub>2</sub> pellets involves two steps:

- specimen polishing, after embedding or not the specimen in a specific resin;
- thermal treatment or chemical etching to reveal the specimen microstructure.