

STN	Karbónové filmy Stanovenie optických vlastností amorfných karbónových filmov spektroskopickou elipsometriou (ISO 23216: 2021)	STN EN ISO 23216 03 8571
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Carbon based films - Determination of optical properties of amorphous carbon films by spectroscopic ellipsometry (ISO 23216:2021)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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Carbon based films - Determination of optical properties of amorphous carbon films by spectroscopic ellipsometry (ISO 23216:2021)

Films à base de carbone - Détermination des propriétés optiques des films de carbone amorphe par ellipsométrie spectroscopique (ISO 23216:2021)

Kohlenstoffschichten - Bestimmung der optischen Eigenschaften von amorphen Kohlenstoffschichten mittels spektroskopischer Ellipsometrie (ISO 23216:2021)

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EN ISO 23216:2022 (E)

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European foreword

The text of ISO 23216:2021 has been prepared by Technical Committee ISO/TC 107 "Metallic and other inorganic coatings" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 23216:2022 by Technical Committee CEN/TC 262 "Metallic and other inorganic coatings, including for corrosion protection and corrosion testing of metals and alloys" the secretariat of which is held by BSI.

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INTERNATIONAL STANDARD

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Carbon based films — Determination of optical properties of amorphous carbon films by spectroscopic ellipsometry

*Films à base de carbone — Détermination des propriétés optiques des
films de carbone amorphe par ellipsométrie spectroscopique*



Reference number
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ISO 23216:2021(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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This document was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

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Introduction

This document provides a determination method and a classification for optical properties of amorphous carbon films by spectroscopic ellipsometry.

Amorphous carbon films have a structure, containing both sp^2 and sp^3 bonded carbon atoms and in several cases also hydrogen. There are graphite-like, polymer-like, glass-like and diamond-like carbon films. Because of their outstanding mechanical properties, amorphous carbon films are used in various hard coating applications on hard metals, e.g. as protective coatings against wear and corrosion in automotive parts. Biomedical and optical applications on alternative substrate materials such as silicon and glass have become more and more important. Currently, amorphous carbon films are classified into several types with regard to their chemical structures, and each type is selectively used according to its appropriate application. For an easy classification of amorphous carbon films, an optically quantified phase fingerprint with high accuracy is provided as a result of an international interlaboratory comparison.

The optical properties of refractive index n and extinction coefficient k determined by spectroscopic ellipsometry are the key quantities for the proposed classification of amorphous carbon films. The interlaboratory comparison demonstrated that a classification within the n - k plane is feasible for all types of amorphous carbon films. This will be beneficial for the identification of the coating type on alternative substrate materials (such as silicon and glass) and additional industrial applications. Spectroscopic ellipsometry as a fast and non-destructive analytical method can also be applied to quality control and development in industrial applications, given that smooth and well-defined substrate materials are used and appropriate modelling is applied.

This document is intended to implement recommended ellipsometric test conditions and the n - k plane classification scheme of amorphous carbon films on silicon wafers.

This document is useful for the complementary optical property classification and quality control of amorphous carbon films.

As amorphous carbon films show a huge diversity of structure and properties, it is crucial to select the appropriate type of amorphous carbon film to exploit their excellent properties in practical use. Therefore, carbon films are characterized by spectroscopic ellipsometry under reasonable conditions. This enables the classification of amorphous carbon films on silicon wafers within the n - k plane acting as a process fingerprint.

Carbon based films — Determination of optical properties of amorphous carbon films by spectroscopic ellipsometry

1 Scope

This document specifies spectroscopic ellipsometry for the determination of optical properties (refractive index n and extinction coefficient k) and the optical classification of different types of amorphous carbon films within the n - k plane.

It is applicable to amorphous carbon films deposited by ionized evaporation, sputtering, arc deposition, plasma-assisted chemical vapour deposition, hot filament techniques and others.

It does not apply to carbon films modified with metals or silicon, amorphous carbon films that have a gradient of composition/property in the thickness, paints and varnishes.

2 Normative references

There are no normative references in this document.

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