

ISO/TS 21356-1:2021 (E)

Nanotechnologies — Structural characterization of graphene — Part 1: Graphene from powders and dispersions

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms and definitions
4	Abbreviated terms
5	Sequence of measurement methods
6	Rapid test for graphitic material using Raman spectroscopy
7	Preparing a liquid dispersion
7.1	General
7.2	Preparing a dispersion of the correct concentration
7.2.1	Powder samples
7.2.2	Samples already in a dispersion
8	Determination of methods
9	Structural characterization using optical microscopy, SEM, AFM and Raman spectroscopy
10	Structural characterization using TEM
11	Surface area determination using the BET method
12	Graphene lateral size and number fraction calculation
Annex A	(informative) Rapid test for graphitic material using Raman spectroscopy
A.1	General
A.2	Sample preparation
A.2.1	Sample preparation from a liquid dispersion
A.2.2	Sample preparation from powder form
A.3	Method
Annex B	(informative) Structural characterization protocol using SEM, AFM and Raman spectroscopy
B.1	General
B.2	Sample preparation
B.2.1	Drop casting for SEM, AFM and Raman spectroscopy
B.2.2	Optical microscopy
B.3	SEM analysis
B.3.1	General
B.3.2	Measurement protocol
B.3.3	Data analysis
B.4	AFM analysis
B.4.1	General
B.4.2	Measurement protocol
B.4.3	Data analysis
B.5	Raman spectroscopy

- B.5.1** **General**
- B.5.2** **Measurement protocol**
- B.5.3** **Data analysis**

Annex C (informative) **Structural characterization using TEM**

- C.1** **General**
- C.2** **Sample preparation for TEM**
- C.3** **Measurement protocol**
- C.4** **Data analysis**

Annex D (informative) **Lateral size and number fraction calculation**

- D.1** **General**
- D.2** **Average lateral flake size**
- D.3** **Number fraction**
- D.3.1** **General**
- D.3.2** **AFM only**
- D.3.3** **AFM combined with SEM or TEM**
- D.3.4** **Raman spectroscopy combined with AFM and SEM or TEM**

Annex E (informative) **Brunauer–Emmett–Teller method**

- E.1** **General**
- E.2** **Sample degassing**
- E.3** **Method**
- E.4** **Analysis**

Annex F (informative) **Additional sample preparation protocols — Silicon dioxide on silicon wafer preparation and cleaning**

Page count: 48