



# Standard Specification for Chromium Sputtering Targets for Thin Film Applications<sup>1</sup>

This standard is issued under the fixed designation F 1367; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers sputtering targets fabricated from chromium metal.

1.2 This specification sets purity grade levels, physical attributes, analytical methods and packaging requirements.

1.3 The values stated in SI units are regarded as standard.

## 2. Referenced Documents

2.1 *ASTM Standards:*

E 112 Test Methods for Determining Average Grain Size<sup>2</sup>

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *raw material lot*—original material lot from which a number of targets is fabricated.

3.1.2 *relative density, n*—actual target density divided by the theoretical density of chromium, 7.21 g/cm<sup>3</sup>.

## 4. Classification

4.1 Grades of chromium are defined in Table 1.

4.2 Grade, as defined in Table 1, is based on the total metallic impurity content of the metallic elements listed in Table 2. Elements not detected shall be counted and reported as present at the detection limit.

## 5. Ordering Information

5.1 Orders for these targets shall include the following:

5.1.1 Grade,

5.1.2 Configuration, (see 8.1 and 8.2),

5.1.3 Whether certification is required, (see 12.1), and

5.1.4 Whether a sample representative of the finished product is required to be provided by the supplier to the purchaser.

## 6. Chemical Composition

6.1 The metallic elements listed in Table 2 shall be assayed and reported.

6.2 Gaseous elements to be assayed and reported are C, O, N and S.

6.3 Other elements may be assayed and reported as agreed

TABLE 1 Chromium Grades<sup>A</sup>

Grade	Implied Purity, %	Metallic Impurity Level by Weight, ppm, max
4N	99.99	100
3N7	99.97	300
3N5	99.95	500
3N	99.9	1000
2N8	99.8	2000

<sup>A</sup>Additional grades may be designated by following the same pattern. That is, examine the purity expressed in weight percent. Count the leading, "9's" and set this number as "n". Then note the first following digit, if present, (rounded if necessary) and call this numeral "x". The grade is expressed as "nNx".

upon between the purchaser and the supplier, but these shall not be counted in determining the grade designation.

6.3.1 Acceptable limits and analytical techniques for additional elements shall be agreed upon between the purchaser and the supplier.

## 7. Physical Properties

7.1 Minimum relative density shall be agreed upon by the purchaser and the supplier.

7.2 Actual target density shall be determined by Archimedes principle or other acceptable techniques.

7.3 Grain size shall be agreed upon between the purchaser and the supplier, and reported in accordance with Test Method E 112.

## 8. Dimensions, Mass, and Permissible Variations

8.1 Each target shall conform to an appropriate engineering drawing.

8.2 Nominal dimensions, tolerances and other attributes shall be agreed upon between purchaser and supplier.

## 9. Workmanship, Finish and Appearance

9.1 Workmanship, finish and appearance shall be agreed upon between the purchaser and the supplier.

## 10. Sampling

10.1 Analyses for impurities shall be performed on a sample that is representative of the finished product.

10.2 Reporting analytical results of the unprocessed raw material lot is not acceptable.

## 11. Analytical Methods

11.1 Analysis for impurities in Table 2 and 6.2 shall be performed as follows:

11.1.1 *Carbon, Oxygen and Sulfur*—Combustion/infrared

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F-1 on Electronics and is the direct responsibility of Subcommittee F01.17 on Sputter Metallization.

Current edition approved Aug. 10, 1998. Published October 1998. Originally published as F 1367-92. Last previous edition F 1367-92.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 03.01.



**TABLE 2 Minimum Metallic Elements To Be Assayed**

Metallic Elements To Be Assayed For

Aluminum, nickel, silicon, titanium, vanadium

spectrometry, mdl of 10 ppm, or less.

11.1.2 *Nitrogen*—Thermal conductivity spectrometry, mdl of 10 ppm, or less.

11.1.3 *All Others*—AA, direct current plasma (DCP), inductively coupled plasma (ICP), spark source mass spectroscopy (SSMS) or glow discharge mass spectroscopy (GDMS), mdl of 5 ppm, or less.

11.1.4 Other analytical techniques may be used provided they can be proved equivalent to the methods specified, and have minimum detection limits of the specified methods.

## 12. Certification

12.1 When required by the purchaser, a certificate of analysis that represents the finished material lot shall be provided for each target.

12.2 Certificate of analysis shall state the manufacturer's or supplier's name, the supplier's lot number, impurity levels, method of analysis, and any other information agreed upon between the purchaser and the supplier.

12.3 Impurity levels may be reported on a certificate of analysis using actual analytical results, or typical results based upon historical statistical data for the same process, as agreed upon between the purchaser and the supplier. The minimum

detection limit for each element listed in Table 2 that was not detected in the analysis shall be noted on the certificate of analysis.

## 13. Product Marking

13.1 Each target shall be marked on a non-sputtering surface with a unique lot number, a unique target number, purity grade, and any other information agreed upon between the purchaser and the supplier.

## 14. Packaging and Package Marking

14.1 Single piece targets shall be individually vacuum or inert gas packed, and enclosed in a shipping carton that ensures target integrity during shipment.

14.2 Each component of multiple piece targets shall be individually vacuum or inert gas packed; the resulting packages shall then be individually or collectively enclosed in a shipping carton that ensures target integrity during shipment.

## 15. Keywords

15.1 chromium; sputtering; targets

*The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.*