Designation: F 1709 – 97

Standard Specification for High Purity Titanium Sputtering Targets for Electronic Thin Film Applications [1]

This standard is issued under the fixed designation F 1709; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers pure titanium sputtering targets used as a raw material in fabricating semiconductor electronic devices.

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

1.2.1 The grade designation is a measure of total metallic impurity content. The grade designation does not necessarily indicate suitability for a particular application because factors other than total metallic impurity may influence performance.

2. Referenced Documents

2.1 *ASTM Standards:*

E 112 Test Methods for Determining the Average Grain Size [2]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *material lot, n—for the purpose of this standard,* a "lot" is material melted into one ingot, and processed as one continuous batch in subsequent thermal-mechanical treatments.

3.1.2 *finished product, n—for the purposes of this standard,* a "finished product" is a manufactured sputtering target, ready for use.

4. Classification

4.1 Grades of titanium sputtering targets are defined in Table 1, based upon total metallic impurity content of the elements listed in Table 2. Impurity contents are reported in parts per million by weight (wt ppm). Higher purity grades, for example "5N5" and" 6N", may be provided, as agreed upon between the purchaser and the supplier.

4.2 Purity grade and total metallic impurity levels are based upon the suite of elements listed in Table 2.

TABLE 1 Titanium Sputtering Target Grades

Grade	Purity, %	Maximum Total Metallic Impurity Content, wt ppm
4N	99.99	100
4N5	99.995	50
5N	99.999	10

5. Ordering Information

5.1 Orders for pure titanium sputtering targets shall include the following:

5.1.1 Grade (see 4.1),

5.1.2 Special requirements concerning impurities, if required (see 6.1, 6.2, 6.3, 6.4),

5.1.3 Grain size, if required (Section 7),

5.1.4 Configuration (Section 8),

5.1.5 Certification required (Section 12), and

5.1.6 Whether or not a sample representative of the finished product is required to be provided by the supplier to the purchaser.

6. Impurities

6.1 The minimum suite of metallic impurity elements to be analyzed is defined in Table 2. Acceptable analysis methods and detection limits are specified in Section 11. Elements not detected will be counted and reported as present at the minimum detection limit ("mdl"). Additional elements may be analyzed and reported as agreed upon between the purchaser and the supplier, but these shall not be counted in defining the grade designation.

6.2 Cesium, chlorine, phosphorus, and tantalum present particular analysis problems. The limits, analysis method, and mdl may be as agreed upon between the purchaser and the supplier.

TABLE 2 Suite of Metallic Elements to be Analyzed and Reported

aluminum	iron	silicon	vanadium
chromium	lead	silver	zinc
cobalt	lithium	potassium	sodium
zirconium	copper	magnesium	thorium
boron	manganese	tin	molybdenum
tungsten	nickel	uranium	

[1] This specification is under the jurisdiction of ASTM Committee F-1 on Electronics and is the direct responsibility of Subcommittee F01.17 on Sputtered Thin Films.

Current edition approved December 10, 1997. Published March 1998. Originally published as F 1709 - 96. Last previous edition F 1709 - 96.

[2] *Annual Book of ASTM Standards,* Vol 03.01.