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## Standard Specification for Molybdenum Oxide Products<sup>1</sup>

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### 1. Scope

1.1 This specification covers three grades of molybdenum oxide, designated as A, B, and molybdc oxide briquets.

1.2 The values stated in inch-pound units are to be regarded as the standard.

### 2. Referenced Documents

2.1 *ASTM Standards:*

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications<sup>2</sup>

E 31 Methods for Chemical Analysis of Ferroalloys<sup>3</sup>

### 3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Quantity,

3.1.2 Name of material,

3.1.3 ASTM designation and year of issue,

3.1.4 Grade,

3.1.5 Size, if appropriate, and

3.1.6 Requirements for packaging, analysis reports, etc. as appropriate.

3.2 Although molybdenum oxide is ordered by total net weight, or contained weight, the customary basis of payment is per pound of contained molybdenum.

### 4. Chemical Requirements

4.1 The various grades shall conform to the requirements as to chemical composition specified in Tables 1 and 2.

4.2 The manufacturer shall furnish an analysis of each shipment showing the elements specified in Table 1.

4.3 The values shown in Table 2 are expected maximums. Upon request of the purchaser, the manufacturer shall furnish an analysis for any of these elements on a cumulative basis over a period mutually agreed upon by the manufacturer and the purchaser.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.18 on Castings.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 14.02.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 03.05.

**TABLE 1 Chemical Requirements<sup>A</sup>**

	Molybdenum Oxide		Molybdc Oxide Briquets
	Grade A	Grade B	
Molybdenum, min <sup>B</sup>	55.0	57.0	51.6
Sulfur, max	0.25	0.10	0.15
Copper, max	1.0	1.0 <sup>C</sup>	0.15

<sup>A</sup>For purposes of determining conformance with this specification, the reported analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Practice E 29.

<sup>B</sup>For the purposes of determining the molybdenum content of any shipment, molybdenum shall be reported to the nearest 0.1 %, applying the same rounding procedure as prescribed in Footnote A.

<sup>C</sup>Copper content may be supplied to 0.15 %, max, when requested by the purchaser.

### 5. Size

5.1 Molybdenum oxide is available in bags, steel drums, or other suitable containers, each with either 5 lb (2.3 kg) or 20 lb (9.1 kg) of contained molybdenum.

5.2 Molybdc oxide briquets weigh about 5 lb each and contain 2.5 lb (1.13 kg) of molybdenum.

### 6. Sampling

6.1 *Sampling Small Bags*—When packed in the standardized small packages, each holding contained molybdenum, the material shall be sampled by selecting at random one twentieth of the bags that may bear the same manufacturing lot number, and the combined content of these bags shall be reduced and analyzed as a separate sample. When a shipment cannot be divided by lot numbers, one twentieth of the total number of bags constituting the shipment shall be selected and treated as one sample. The material forming a sample shall be crushed if

**TABLE 2 Supplementary Chemical Requirements<sup>A,B</sup>**

	Composition, %		
	Molybdenum Oxide		Molybdc Oxide Briquets
	Grade A	Grade B	
Carbon	trace	trace	12.0 (approx)
Phosphorus, max	0.050	0.050	0.050

<sup>A</sup>See Footnote A of Table 1.

<sup>B</sup>The composition of molybdenum oxide shall be within these limits; however, an analysis of each lot is not required. The manufacturer shall supply upon request the results of an analysis for these elements on a cumulative basis over a period mutually agreed upon by the manufacturer and the purchaser.



necessary, and in any event passed through a No. 10 (2.00-mm) sieve. The sample after sieving shall be thoroughly mixed by coning and then reduced to about 2 lb (0.9 kg) by quartering or by means of a riffle sampler. The reduced sample shall then be crushed and passed through a No. 60 (250- $\mu$ m) sieve. The sample after sieving shall again be mixed by coning and then divided through a riffle, preferably a Jones divider, into the required number of analytical samples.

**6.2 Sampling Large Containers**—When packed in drums or large bags or cartons, the material shall be sampled by selecting about one twentieth of the content of each package that may bear the same manufacturing lot number, and the combined material selected shall be reduced and analyzed as a separate sample. When a shipment cannot be divided by lot numbers, about one twentieth of the content of each package in the shipment shall be selected, and the combined material selected shall be treated as one sample. The material comprising a sample shall be thoroughly mixed by coning and reduced by half-shoveling, alternating the operations until the residual weight reaches about 40 lb (18.1 kg). Segregation of sizes shall be carefully avoided. The sample thus reduced shall be crushed, if necessary, to pass through a No. 10 (2.00-mm) sieve, and the subsequent sampling procedure shall be as prescribed in 6.1 .

**6.3 Correcting Sample to Dry Net Weight**—Absorption of moisture by the material would depress the analytical percentages with respect to the dry basis, on which the product was analyzed when packaged. Accordingly, any analytical sample shall be dried at 110°C, before analysis, and the sampler's moist net weight of the shipment, of a manufacturing lot, or of any constituent package shall be appropriately corrected to the corresponding dry weight, thus leading to the proper weight of contained molybdenum.

## **7. Chemical Analysis**

7.1 The chemical analysis of the material shall be made in accordance with the procedure for molybdenum oxide as

described in Methods E 31, or alternative methods which will yield equivalent results.

7.2 If alternative methods of analysis are used, in case of discrepancy, Methods E 31 shall be used for referee.

7.3 Where no method is given in Methods E 31 for the analysis of a particular element, the analysis shall be made in accordance with a procedure agreed upon between the manufacturer and the purchaser.

## **8. Inspection**

8.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specification.

## **9. Rejection**

9.1 Any claims or rejections shall be made to the manufacturer within 45 days from receipt of material by the purchaser.

## **10. Marking**

10.1 When the shipment is made in containers each shall be marked on the container or on a label or tag attached thereto. The marking shall show the material, the grade designation, the ASTM designation, the size, the lot number, gross, tare, and net weight, and the name, brand, or trademark of the manufacturer.

## **11. Packaging**

11.1 The molybdenum oxide shall be packaged in sound containers in such a manner that none of the product is lost or contaminated in shipment.

## **12. Keywords**

12.1 molybdenum; molybdenum oxide

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