



Designation: E 438 – 92 (Reapproved 2001)<sup>ε1</sup>

## Standard Specification for Glasses in Laboratory Apparatus<sup>1</sup>

This standard is issued under the fixed designation E 438; 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.

<sup>ε1</sup> NOTE—Keywords were added editorially October 2001.

### 1. Scope

1.1 This specification covers the glasses commonly used to manufacture laboratory glass apparatus.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

C 225 Test Methods for Resistance of Glass Containers to Chemical Attack<sup>2</sup>

C 338 Test Method for Softening Point of Glass<sup>2</sup>

C 598 Test Method for Annealing Point and Strain Point of Glass by Beam Bending<sup>2</sup>

C 693 Test Method for Density of Glass by Buoyancy<sup>2</sup>

C 729 Test Method for Density of Glass by the Sink-Float Comparator<sup>2</sup>

E 228 Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer<sup>3</sup>

### 3. Classification

3.1 Three types are included, as follows:

3.1.1 *Type I, Class A*—A low-expansion borosilicate glass.

3.1.2 *Type I, Class B*—An alumino-borosilicate glass.

3.1.3 *Type II*—A soda-lime glass.

### 4. Chemical Requirements

4.1 The Type I, Class A and B glasses shall have the major constituents and comply with the restrictions on trace constituents given in Table 1. The major constituents will be varied to maintain the physical requirements as shown.

4.2 Suitable Type II glasses may vary somewhat in chemical composition and still meet essential physical requirements. Two such compositions are shown in Table 2; both are readily available and are used for laboratory apparatus.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E41 on Laboratory Apparatus and is the direct responsibility of Subcommittee E41.01 on Glass Apparatus.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.02.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.02.

TABLE 1 Chemical Requirements of Type I Glasses

	Type I, Class A, weight %	Type I, Class B, weight %
Major constituents, approximate:		
SiO <sub>2</sub>	81	73
B <sub>2</sub> O <sub>3</sub>	13	10
Al <sub>2</sub> O <sub>3</sub>	2	7
BaO	see below	0–2
CaO	see below	1
Na <sub>2</sub> O	4	6
K <sub>2</sub> O	see below	1
Trace constituents, max:		
As <sub>2</sub> O <sub>2</sub> plus Sb <sub>2</sub> O <sub>3</sub>	0.005	0.1
PbO	0.1	0.1
MgO	0.1	0.3
ZnO	0.1	0.1
CaO	0.1	see above
K <sub>2</sub> O	0.75 <sup>A</sup>	see above
All other constituents, max	0.2	1.0

<sup>A</sup> Each manufacturer must publish the maximum percentage in his glass because certain limited applications require a level under 0.1 %.

### 5. Physical Requirements

5.1 The physical requirements for glasses shall be as prescribed in Table 3. The tolerances listed in Table 3 must be on the published values of the manufacturer's specific glass compositions.

### 6. Keywords

6.1 glasses; laboratory

TABLE 2 Chemical Requirements of Type II Glasses

	Composition A, weight %	Composition B, weight %
Major constituents, approximate:		
SiO <sub>2</sub>	68	72
B <sub>2</sub> O <sub>3</sub>	2	...
Al <sub>2</sub> O <sub>3</sub>	3	2
BaO	2	...
CaO	5	5
MgO	4	4
Na <sub>2</sub> O	15	16
K <sub>2</sub> O	1	1
Trace constituents, max:		
As <sub>2</sub> O <sub>3</sub> + Sb <sub>2</sub> O <sub>3</sub>	0.1	0.1
Pb O	0.1	0.1
All other constituents, max	1.0	1.0