

# ISO 11235:2023-07 (E)

## Rubber compounding ingredients - Sulfenamide accelerators - Test methods

---

<b>Contents</b>		<b>Page</b>
Foreword .....		v
<b>1</b>	<b>Scope .....</b>	<b>1</b>
<b>2</b>	<b>Normative references .....</b>	<b>1</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>2</b>
<b>4</b>	<b>Determination of physical and chemical properties .....</b>	<b>2</b>
<b>4.1</b>	<b>Sampling .....</b>	<b>2</b>
<b>4.2</b>	<b>Test methods .....</b>	<b>2</b>
<b>4.3</b>	<b>Limit of acceptance .....</b>	<b>2</b>
<b>5</b>	<b>Test methods for purity .....</b>	<b>3</b>
<b>5.1</b>	<b>Method to determine purity by reduction with MBT and titration .....</b>	<b>3</b>
<b>5.1.1</b>	<b>Purpose .....</b>	<b>3</b>
<b>5.1.2</b>	<b>Principle .....</b>	<b>3</b>
<b>5.1.3</b>	<b>Reagents .....</b>	<b>3</b>
<b>5.1.4</b>	<b>Apparatus .....</b>	<b>4</b>
<b>5.1.5</b>	<b>Procedure .....</b>	<b>4</b>
<b>5.1.6</b>	<b>Expression of results (methods A and B) .....</b>	<b>5</b>
<b>5.2</b>	<b>Method to determine purity by high performance liquid chromatography (HPLC) .....</b>	<b>6</b>
<b>5.2.1</b>	<b>Purpose .....</b>	<b>6</b>
<b>5.2.2</b>	<b>Principle .....</b>	<b>7</b>
<b>5.2.3</b>	<b>Significance and use .....</b>	<b>7</b>
<b>5.2.4</b>	<b>Interferences .....</b>	<b>7</b>
<b>5.2.5</b>	<b>Reagents and materials .....</b>	<b>7</b>
<b>5.2.6</b>	<b>Apparatus .....</b>	<b>7</b>
<b>5.2.7</b>	<b>Calibration and standardization .....</b>	<b>8</b>
<b>5.2.8</b>	<b>Procedure .....</b>	<b>8</b>
<b>5.2.9</b>	<b>Sample analysis .....</b>	<b>9</b>
<b>5.2.10</b>	<b>Expression of results .....</b>	<b>9</b>
<b>5.3</b>	<b>Precision .....</b>	<b>10</b>
<b>6</b>	<b>Test method for insoluble material .....</b>	<b>10</b>
<b>6.1</b>	<b>Purpose .....</b>	<b>10</b>
<b>6.2</b>	<b>Principle .....</b>	<b>10</b>
<b>6.3</b>	<b>Significance and use .....</b>	<b>10</b>
<b>6.4</b>	<b>Reagents .....</b>	<b>11</b>
<b>6.5</b>	<b>Apparatus .....</b>	<b>11</b>
<b>6.6</b>	<b>Procedure .....</b>	<b>12</b>
<b>6.7</b>	<b>Expression of results .....</b>	<b>12</b>
<b>7</b>	<b>Test methods for melting range .....</b>	<b>12</b>
<b>7.1</b>	<b>Melting range by capillary tube .....</b>	<b>12</b>
<b>7.1.1</b>	<b>Purpose .....</b>	<b>12</b>
<b>7.1.2</b>	<b>Significance and use .....</b>	<b>12</b>
<b>7.1.3</b>	<b>Limitations .....</b>	<b>13</b>
<b>7.1.4</b>	<b>Apparatus .....</b>	<b>13</b>
<b>7.1.5</b>	<b>Preparation of test sample .....</b>	<b>13</b>
<b>7.1.6</b>	<b>Procedure .....</b>	<b>13</b>
<b>7.2</b>	<b>Melting range by differential scanning calorimetry (DSC) .....</b>	<b>14</b>

7.2.1	Purpose .....	14
7.2.2	Significance and use .....	14
7.2.3	Limitations .....	14
7.2.4	Apparatus .....	14
7.2.5	Preparation of test sample .....	14
7.2.6	Procedure .....	14
8	Test method for volatile material .....	15
8.1	Purpose .....	15
8.2	Principle .....	15
8.3	Apparatus .....	15
8.4	Procedure .....	16
8.5	Expression of results .....	16
9	Test method for wet sieve analysis .....	16
9.1	Purpose .....	16
9.2	Significance and use .....	16
9.3	Materials .....	17
9.3.1	Liquid detergent, neutral .....	17
9.4	Apparatus .....	17
9.5	Procedure .....	17
9.6	Expression of results .....	17
10	Test method for the determination of ash .....	18
10.1	Purpose .....	18
10.2	Principle .....	18
10.3	Significance and use .....	18
10.4	Apparatus .....	18
10.5	Procedure .....	19
10.6	Expression of results .....	19
11	Test report .....	19
Annex A (informative)	Classification and key properties of sulfenamide (class 1) vulcanization accelerators .....	21
Annex B (informative)	Precision .....	24
Bibliography	.....	26