powder wet with oil burns quiescently. Sodium melts and flows
while burning; calcium does not. Some metals (e.g., uranium),
aquire an increased tendency to burn after prolonged exposure
to moist air, while prolonged exposure to dry air may make it
more difficult to ignite the metal.

Inasmuch as the extinguishment of fires in combustible
metals involves techniques not commonly encountered in con-
ventional fire-fighting operations, it is good practice for those
responsible for controlling combustible metal fires to gain
experience in this area prior to the actual fire emergency. Fire
fighters should practice extinguishing fires in those metals in an
isolated outdoor location.

Where metals other than those described in this chapter are
in use, it is most important that fire fighters gain some experi-
ence in extinguishing test fires involving the specific com-
burnible metals.

MAGNESIUM

Properties

The melting temperature of massive magnesium is very close to
its melting point of 1202°F (650°C) (Table 8.16.1). However,
ignition of magnesium in certain forms may occur at tempera-
tures well below 1202°F (650°C); magnesium ribbons and shav-
ings can be ignited under certain conditions at about 950°F
(510°C), and finely divided magnesium powder can ignite below
900°F (482°C).

<table>
<thead>
<tr>
<th>Metal</th>
<th>Melting Point</th>
<th>Boiling Point</th>
<th>Solid Metal Ignition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>1220°F</td>
<td>660°C</td>
<td>445°F 2452°C 1832°C</td>
</tr>
<tr>
<td>Barium</td>
<td>1337°F</td>
<td>725°C</td>
<td>2084°F 1140°F 347°F</td>
</tr>
<tr>
<td>Calcium</td>
<td>1548°F</td>
<td>842°C</td>
<td>2625°F 1441°F 1300°F</td>
</tr>
<tr>
<td>Hafnium</td>
<td>4032°F</td>
<td>2222°C</td>
<td>9750°F 5399°F</td>
</tr>
<tr>
<td>Iron</td>
<td>2795°F</td>
<td>1535°C</td>
<td>5432°F 3000°F 1706°F</td>
</tr>
<tr>
<td>Lithium</td>
<td>367°F</td>
<td>186°C</td>
<td>2437°F 1336°F 356°F</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1202°F</td>
<td>650°C</td>
<td>2030°F 1110°F 1153°F</td>
</tr>
<tr>
<td>Plutonium</td>
<td>1184°F</td>
<td>640°C</td>
<td>6000°F 3316°F 1112°F</td>
</tr>
<tr>
<td>Potassium</td>
<td>144°F</td>
<td>62°C</td>
<td>1400°F 760°F 156°F</td>
</tr>
<tr>
<td>Sodium</td>
<td>208°F</td>
<td>98°C</td>
<td>1616°F 880°F 239°F</td>
</tr>
<tr>
<td>Strontium</td>
<td>1425°F</td>
<td>774°C</td>
<td>2102°F 1150°F 1328°F</td>
</tr>
<tr>
<td>Thorium</td>
<td>3353°F</td>
<td>1845°C</td>
<td>8132°F 4500°F 932°F</td>
</tr>
<tr>
<td>Titanium</td>
<td>3140°F</td>
<td>1727°C</td>
<td>5900°F 3260°F 2900°F</td>
</tr>
<tr>
<td>Uranium</td>
<td>2070°F</td>
<td>1132°C</td>
<td>6390°F 3816°F 6900°F</td>
</tr>
<tr>
<td>Zinc</td>
<td>786°F</td>
<td>419°C</td>
<td>1665°F 907°F 1652°F</td>
</tr>
<tr>
<td>Zirconium</td>
<td>3326°F</td>
<td>1830°C</td>
<td>6470°F 3577°F 2552°F</td>
</tr>
</tbody>
</table>

*Ignition in oxygen.
*Spontaneous ignition in moist air.
*Above indicated temperature.
*Below indicated temperature.

Metal marketed under different trade names and commonly
referred to as "magnesium" may be one of a large number of
different alloys containing principally magnesium, but also sig-
nificant percentages of aluminum, manganese, and zinc. Some
of these alloys have ignition temperatures considerably lower
than pure magnesium, and certain magnesium alloys will ignite
at temperatures as low as 800°F (427°C). Flame temperatures
reach 2500°F (1371°C), although flame height above burn-
ing metal is usually less than 12 in. (305 mm).

Thin, small pieces of magnesium, such as ribbons, chips,
and shavings, may be ignited by a match flame, whereas castings
and other large pieces are difficult to ignite even with a torch be-
cause of the high thermal conductivity of the metal. In order to
ignite a large piece of magnesium, it is usually necessary to raise
the entire piece to the ignition temperature. Magnesium melts as
it burns and may form puddles of molten magnesium, which may
present explosion hazards in the presence of water.

Scrap magnesium chips or other fines may burn as the result
of ignition of waste rags or other contaminants. Chips wet with
water, water-soluble oils, and oils containing more than 0.2 per-
cent fatty acid may generate hydrogen gas. Chips wet with ani-
mal or vegetable oils may burn if the oils ignite spontaneously.
Fines from grinding operations generate flammable hydrogen
when submerged in water, but the metal particles themselves
cannot be ignited if kept immersed. Grinding fines that are slightly
wetted with water may generate sufficient heat to ignite sponta-
neously in air, burning violently as oxygen is extracted from the
water with the release of hydrogen, which can also ignite.

Storage and Handling
(Including Transportation)

The more massive a piece of magnesium, the more difficult it is to
ignite. Once ignited, however, magnesium burns intensely and is
difficult to extinguish. The storage recommendations in NFPA 484
take these properties into consideration. Recommended maximum
quantities of various sizes and forms to be stored in specific loca-
tions are covered in this standard. The storage building preferably
should be noncombustible, and the magnesium should be segre-
gated from combustible material as a fire prevention measure.

With easily ignited lightweight castings, segregation from
combustible materials is especially important. In the case of dry
fines (fine magnesium scrap), storage in noncombustible covered
containers in separate fire-resistive storage buildings or rooms
with explosion venting facilities is preferable. For combustible
buildings or buildings containing combustible contents, NFPA
484 recommends automatic sprinkler protection to ensure prompt
control of a fire before the magnesium becomes involved.

Because of the possibility of hydrogen generation and of
spontaneous heating of fines wet with coolants (other than neu-
tral mineral oil), it is preferable to store wet scrap fines outdoors.
Covered noncombustible containers should be vented.

Magnesium in powder, pellet, or ribbon form is shipped as
a flammable solid and must be appropriately labeled according to
U.S. Department of Transportation (DOT) requirements. Mas-
vive pieces or castings do not require special shipping safeguards.

If dry magnesium scrap in the form of burlings, shavings,
and turnings is to be shipped in interstate commerce in less-than-