Gemstone Firing Guide

Many natural gemstones can be set into metal clay and fired in place. Other gemstones will not survive the heat of a kiln and should be set after firing. The charts below show the results of kiln and torch tests that have been performed on both natural and synthetic gemstones, adapted with permission from the original testing by Kevin Whitmore of Rio Grande, with additional testing by Cool Tools.

This information is for reference only and should be used as a guide. There is always some risk of losing a gemstone even if others of its kind have survived in the past. Gemstones may have internal flaws that can be liquid or gaseous filled, or contain crystals of other materials that can cause the gemstone to fail where it usually does not. This guide aims to help metal clay artists sort out gemstones that are known to survive firing from those that are not.

Natural Gemstone Firing Guide

All temperatures are full ramp unless otherwise noted. Never crash cool gemstones.

Natural Gemstones	Mineral Group	Mohs Scale	No Fire	Firing Temperature	Hold Time	Open Shelf	Carbon Fire	Torch Fire 2 minutes
Agate (Cameo)	Quartz	7	♦					
Alexandrite (hydrothermal grown)	Chrisoberyl	8.5		1650°F / 899°C	2 hours		♦	♦
Alexandrite Cat's Eye (hydrothermal grown)	Chrisoberyl	8.5		1650°F / 899°C	2 hours		♦	♦
Almandine Garnet	Garnet	6.5 - 7.5		1560°F / 849°C	30 minutes		♦	♦
Amazonite	Feldspar	6 - 6.5		1200°F / 649°C	30 minutes		♦	♦
Amethyst	Quartz	7	♦					
Aquamarine	Beryl	7.5 - 8	♦					
Aventurine	Quartz	7	♦					
Black Onyx	Quartz	7	♦					
Black Star Sapphire	Corundum	9		1650°F / 899°C	2 hours		♦	♦
Carnelian	Quartz	7	♦					
Chalcedony	Quartz	7	♦					
Chrome Diopside	Pyroxene	5 - 6		1200°F / 649°C	30 minutes		♦	
Citrine	Quartz	7	♦					
Demantoid Garnet	Garnet	6.5 - 7.5		1560°F / 849°C	30 minutes		♦	♦
Diamond	Diamond	10	♦					
Emerald	Beryl	7.5 - 8	♦					
Fire Opal	Silicate	6 - 6.5	♦					

Natural Gemstones	Mineral Group	Mohs Scale	No Fire	Firing Temperature	Hold Time	Open Shelf	Carbon Fire	Torch Fire 2 minutes
Hematite	Iron Mineral	5.5 - 6.5		1650°F / 899°C	2 hours		♦	♦
Iolite	Iolite	7 - 7.5	♦					
Jadeite	Quartz	5 - 6	♦					
Labradorite	Feldspar	6 - 6.5		1200°F / 649°C	30 minutes		♦	
Lapis - Denim	Rock	5.5	♦					
Lapis Luzuli	Rock	5.5	♦					
Malachite	Borate	3.5 - 4	♦					
Moonstone - Gray	Feldspar	6 - 6.5		1200°F / 649°C	30 minutes		♦	
Moonstone - Peach	Feldspar	6 - 6.5		1110°F / 599°C	30 minutes		♦	
Moonstone - White	Feldspar	6 - 6.5		1110°F / 599°C	30 minutes		♦	
Padparadscha Sapphire	Corundum	9		1650°F / 899°C	2 hours		♦	♦
Peridot	Olivine	7		1470°F / 799°C	30 minutes		♦	♦
Pyrite	Sulphide	6 - 6.5	♦					
Pyrope Garnet	Garnet	7 - 7.5		1560°F / 849°C	30 minutes		♦	♦
Rhodocrosite	Calcite	3.5 - 4.5	♦					
Rhodolite Garnet	Garnet	7 - 7.5		1470°F / 799°C	30 minutes		♦	♦
Rose Quartz	Quartz	7	♦					
Ruby	Corundum	9		1650°F / 899°C	2 hours		♦	♦
Rutilated Quartz	Quartz	7	♦					
Sapphire	Corundum	9		1650°F / 899°C	2 hours		♦	♦
Smokey Quartz	Quartz	7	♦					
Spinel	Spinel	8		1650°F / 899°C	1 hour		♦	
Star Diopside	Pyroxene	5 - 6		1200°F / 649°C	30 minutes		♦	♦
Sunstone	Feldspar	6 - 6.5		1200°F / 649°C	30 minutes		♦	
Tanzanite	Zoisite	6.5 - 7.5		1600°F / 871°C	30 minutes		♦	♦
Topaz (all varieties)	Topaz	8	♦					
Tourmaline - Green	Tourmaline	7 - 7.5		1200°F / 649°C	30 minutes		♦	
Tourmaline - Pink	Tourmaline	7 - 7.5	♦					
Tsavorite Garnet	Garnet	7 - 7.5		1470°F / 799°C	30 minutes		♦	♦
Turquoise	Phosphate	5 - 6	♦					
Zircon	Neosilicate	7.5		1650°F / 899°C	1 hour		♦	♦

- Diamonds should not be fired on an open kiln shelf. Some very clean stones can be torch fired, but may result in a cloudy stone. The safest method is to fire in activated carbon. We do not recommend firing diamonds.
- Pyrite is dangerous in the kiln. Pyrite contains sulphur which can be explosive when heated.
- Lapis Lazuli is not a mineral, but a microcrystaline rock composed mainly of the mineral lazurite, with some pyrite and white calcite.
- Denim Lapis is a type of lapis with less lazurite and more white calcite.

Cubic Zirconia & Lab Created Gemstone Firing Guide

All temperatures are full ramp unless otherwise noted. Never crash cool gemstones.

Cubic Zirconia Gemstones	Mineral Group	Mohs Scale	No Fire	Firing Temperature	Hold Time	Open Shelf	Carbon Fire	Torch Fire 2 minutes
Alexandrite	Simulant	8.5	♦					
Amethyst	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Champagne	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Diamond - White	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Diamond - Yellow	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Emerald (Columbian)	Simulant	8.5		1110°F / 599°C	10 minutes		♦	
Fire Opal (Red/Orange)	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Garnet	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Green Apple	Simulant	8.5		1110°F / 599°C	30 minutes		♦	
Jet Black	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	
Lavender (Light Amethyst)	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Olivine*	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Sapphire - Pink	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Tanzanite	Simulant	8.5		1110°F / 599°C	10 minutes		♦	
Topaz - Blue	Simulant	8.5		1525°F / 829°C	1 hour		♦	
Topaz - Smoked	Simulant	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦

***Olivine cubic zirconia darkened slightly after firing**

Synthetic Lab Gemstones	Mineral Group	Mohs Scale	No Fire	Firing Temperature	Hold Time	Open Shelf	Carbon Fire	Torch Fire 2 minutes
Alexandrite*	Synthetic	8.5		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Corundum - Blue Sapphire	Synthetic	9		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Corundum* - Citrine Sapphire / Golden Topaz	Synthetic	9		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Emerald	Synthetic	7.5 - 8		1470°F / 799°C	30 minutes		♦	
Opal	Synthetic	5.5 - 6	♦					
Ruby	Synthetic	9		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Sapphire - Padparadsha - Gold	Synthetic	9		1675°F / 913°C	2 - 4 hours	♦	♦	♦
Spinel - Blue	Synthetic	9		1675°F / 913°C	2 - 4 hours	♦	♦	♦

***Alexandrite and Corundum Citrine/Gold lab gemstones darkened slightly after firing**

Carbon Firing

Carbon is used as a firing media for base metal clays because one of its properties is the ability to adsorb* oxygen. Since oxygen is the element that causes firescale to form when copper alloys are heated, it follows the same theory that it should also protect gems that are sensitive to oxygen.

Copper-based bronze and copper clays are buried in activated carbon during firing to avoid the creation of firescale that is difficult to remove from the surface of the fired metal. Firescale is created when copper is heated in the presence of oxygen.

Some stones can only be embedded in low-fire clays. If you wanted a very strong product or wanted to use a clay that required a 2 - 4 hour firing, choose an appropriate gemstone or set after firing.

Firing a Carbon-Safe Stone in Bronze or Copper Clays

Most cubic zirconia and lab gemstones can be fired in carbon. Firing gemstones in copper-bearing clays is very simple. Embed your chosen stone in your bronze or copper clay, dry and fire as usual in activated carbon. The carbon adsorbs oxygen during firing, and the lack of oxygen protects the stone from burning. Any stone marked as Carbon-Safe is oxygen-sensitive, but can be safely fired when protected by activated carbon.

Firing a Carbon-Safe Stone in Silver Clays

With this technique, you can safely fire most CZs and Lab gemstones in all forms of silver clay at the ideal temperature without sacrificing the stone or the integrity of the final product.

Note: EZ960 Sterling requires carbon firing only if the gemstone that you are embedding requires carbon firing.

*Carbon is an adsorbent. Adsorb can be termed as a process by which the liquid or gas is not absorbed but it only forms on the surface.

Nano Gems

Sterling & Silver Clay

Nano gems are safe to fire up to 1675°F / 913°C on an open shelf in sterling and fine silver clays, with the exception of the Dark Orange and Orange, which can safely be fired up to 1650°F / 899°C on an open shelf in sterling and fine silver clays.

Base Metal Clay

There is a chance for Nano gems to change color when used in base metal clays. We recommend testing with your chosen base metal clay prior to creation of your final piece.

Note: It is very important to fire with an azure, or a hole for light to pass through, behind the gem. Without an azure, Nano gems can change color, get muddy, or lose luster.