

LA MERIDIANA



OXIDATION AND REDUCTION FIRING

The possible states of atmosphere in kilns are oxidizing, neutral and reducing.

- **Oxidizing atmosphere** occurs when unburnt oxygen is available in the kiln chamber.
- **Neutral atmosphere** where neither oxygen nor unburnt or incompletely burnt carbon are present.
- **Reducing atmosphere** happens where unburnt or partially burnt carbon are present and, as there is no available oxygen, the oxygen-hungry carbon seeks out oxygen from those oxides in the clay or glaze which are capable of giving up oxygen.

Two colouring oxides are capable of giving up oxygen in reducing conditions.

1. Ferric iron oxide, Fe_2O_3 , is reduced to ferrous iron oxide, FeO .
2. Cupric copper oxide, CuO_2 , is reduced to cuprous copper oxide, CuO .

In both these reactions the ratio of oxygen to metal is reduced - hence the name.

Both these changes involve a colour change and both are reversible, unless the glaze containing it vitrifies while the oxide is in a reduced state. Though the change of colour which occurs with copper is more dramatic, from green to pinks and red glazes, the change involved in iron reduction, from tans and browns to pale grey-greens and grey-blues, is the more important because iron oxide is present in virtually all ceramic materials at least as a trace of impurity. These minute amounts of iron make the difference between the yellow-white of oxidised porcelain and the blue-white of reduced porcelain.

In flame kilns, reduction can be created by reducing the air available for combustion to the point where no free oxygen is available in the kiln chamber. This can usually be done without creating continuous black smoke which is usually a sign that reduction is excessive. Excessive reduction may lead to the trapping of carbon in glazes and although a waste of fuel, for some glazes it can be transformed in a technique of firing.

When viewed through a spy hole, a reduction atmosphere has a foggy quality quite different from the clear brightness of an oxidizing atmosphere.

In electric kilns and muffle kilns reduction can be induced by introducing combustible material in a convenient form. Very little material is needed as it only has to burn away the oxygen in the chamber. Reduction will shorten the life of the Kanthal element wire. It's a tricky way to do it, with some kind of results.