



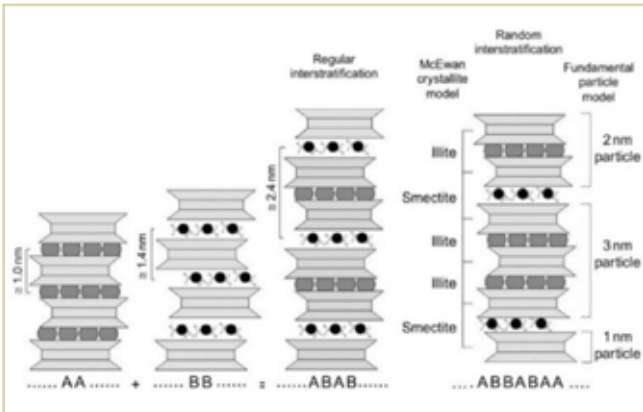
## WHERE ATMOSPHERE MAKES COLOR

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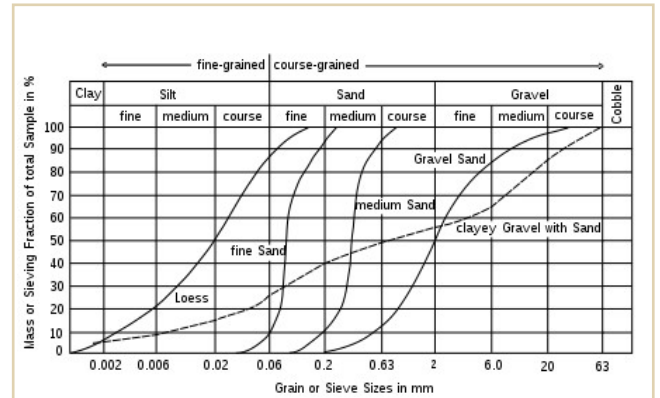
**LINGI**  
MADE IN GERMANY



# Material Analysis with Focus on Classification



Types of Clay Minerals  
For the determination of the firing properties



Grain Size Distribution  
For the determination of black heart formation and gloss

22 <b>Ti</b> Titanium	23 <b>V</b> Vanadium	24 <b>Cr</b> Chromium	25 <b>Mn</b> Manganese	26 <b>Fe</b> Iron
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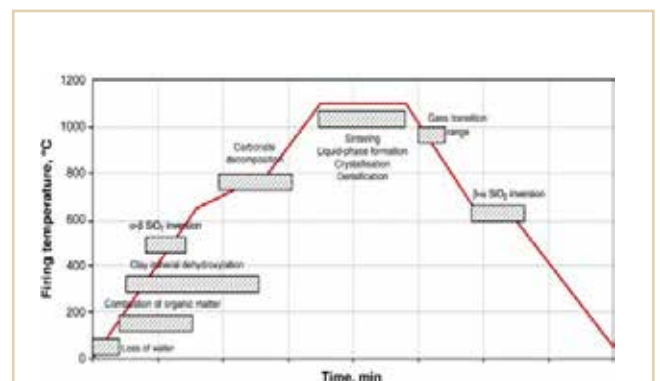
Content of Coloring Agents (Fe; Mn; Ti)  
For the determination of possible colors

6 <b>C</b> Carbon
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Amount of Carbon  
For the determination of black heart formation and gloss

11 <b>Na</b> Sodium	12 <b>Mg</b> Magnesium
19 <b>K</b> Potassium	20 <b>Ca</b> Calcium

Content of vitrifying agents (Na; Mg; Ca; K)  
For the determination of the firing window



Firing Curve  
For the determination of the reduction process

## Possible Reduction Types

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### ■ Reduction from the inside:

Firing in oxidized atmosphere. Reduction takes place due to the carbon within the body. A controlled black heart formation takes place where the bricks stand close together and degassing of carbon is restrained.

### ■ Flashing:

Complete lack of oxygen or excess of fuel for a maximum of 5 minutes with fast cooling after reduction. It leads to a vitrification of the surface with inclusion of iron and manganese with a color change to brown or green. The temperatures exceed the regular firing temperatures by up to 200°F. Reduction takes place only at the surface and causes vitrification. The colors are not very dark and often affect only parts of the bricks. They often vary between oxidized (red) and reduced (brown or blue). Below 1200°F (650°C) the color is frozen and will remain stable.

### ■ Long Flashing:

Complete lack of oxygen or excess of fuel for a maximum of 15 minutes with fast cooling after reduction. It leads to a vitrification of the surface with inclusion of iron and manganese with a color change to brown or green. The temperatures exceed the regular firing temperatures by up to 200°F. Reduction takes place only at the surface and causes vitrification. The colors at the visible parts of the bricks are very dark. The covered parts remain their oxidized colors. Below 1200°F (650°C) the color is frozen and will remain stable.

### ■ Periodic Reduction:

Complete lack of oxygen or excess of fuel for most of the sintering time with fast cooling, calming time or oxidizing firing after reduction. Oxidized firing or calming is necessary when manganese is included. A color change to grey or black takes place. The temperatures exceed the regular firing temperatures by up to 50°F for a very short time at the end of the reduction. This leads partially to a vitrification of the surface. Reduction infiltrates the brick when it starts before the sintering temperature. Usually the black color infiltrates the brick completely. The colors are very dark and buff. They affect all parts of the bricks when the atmosphere does not move. Below 1200°F (650°C) the color is frozen and will remain stable.

### ■ Permanent or Continuous Reduction:

Complete lack of oxygen or excess of fuel for most of the sintering time with fast cooling, calming time or oxidizing firing after reduction. Oxidized firing or calming is necessary when manganese is included. A color change to grey or black takes place. The temperatures exceed the regular firing temperatures by up to 50°F for a very short time at the end of the reduction. This leads partially to a vitrification of the surface. Reduction infiltrates the brick when it starts before the sintering temperature. Usually the black color infiltrates the brick completely. The colors are very dark and buff. They affect all parts of the bricks when the atmosphere does not move. Below 1200°F (650°C) the color is frozen and will remain stable.

### ■ Steaming:

Regular oxidized firing before the cooling process. Cooling process without any oxygen down to 1200°F (650°C). The brick becomes completely infiltrated by a silver grey color. The atmosphere consists of CO and H<sub>2</sub>O and is not touched for the entire cooling process. Below 1200°F (650°C) the color is frozen and will remain stable.

# Our Incentive for Research

From this



Laboratory kiln for firing trials with varying atmospheres

To this



Reduction group with extra gas supply for reduced firing

And as Result



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