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19.0.B Discussion Refractory Materials

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### RECORDER REPORT, Chem 444A “Fire & Ice”

<table>
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<tr>
<th>Group Member Name</th>
<th>Role</th>
<th>Date: 4-2-15</th>
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<tr>
<td>Charles Coretta</td>
<td>Recorder</td>
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<td>Sean</td>
<td>Recorder</td>
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<tr>
<td>Kaleigh Zukowski</td>
<td>Speaker</td>
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<td>Timothy Casbon</td>
<td>Manager</td>
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<td>Becky Retting</td>
<td>Reflector</td>
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<td>Marrison</td>
<td>Speaker</td>
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1. The brick, being a refactory, keeps in the heat that is produced by the fire. It is kept in the chimney, and because heat rises, it leaves the top of the chimney.

2. At an atomic level, the atoms are beginning to spread up or move apart from each other as heat is added. This causes the steel to lose strength, because the atoms aren’t stacked, and it also causes it to creep, because they are not packed.

3. The heat is needed at first to melt the batches. When this happens, a concoction of liquid glass is formed. This liquid glass is then cooled for a bit, so that it is able to be cut up and divided. Glass is made of sand, soda ash, limestone, and other ingredients, all of which have strong bonds. The high temperatures break the bonds and allow the ingredients to become liquid.
REORDER REPORT, Chem 444A “Fire & Ice”

Group Member Name | Role | Date: April 2
-------------------|------|------------------
Emily             | Spokespersons |
Kyle              | manager      |
Jace              | recorder     |
Nick              | Reflector    |

1. The heat travels with the flow of air up the chimney, rather than being absorbed into the bricks because that would overheat the house structure.

2. When adding heat to a sand, its molecules vibrate more and are less rigid and structured. This aligns with what the article says about deformation under high temperatures.

3. During the high heat portions far beyond the top of Al, such a high temperature allows for lower intermolecular attraction and allows for pure aluminum to be extracted. It needs to be hot enough so that Alumina will separate so that pure aluminum can be obtained.
Due to it being made of this refractory material, the heat is not absorbed by the brick but instead it exits the chimney.

As heat is added to steel the molecules begin to move faster and the metal begins to melt. This creeping phenomena could be where the graph for a phase change is flat and it is a slow process putting stress on the metal.

It is almost like a filtering process. A mixture of raw materials gets put into the rotary clinker and what is not needed gets emitted as gas in gas form and what creates the cement finishes the process. During the high temperature process the raw material that have lower boiling points will be released. As the materials go through the kiln it 'the CaCO3 forms lime (CaO) by releasing CO2.' The actual process of turning into a molten liquid in the cement clinker.

The temperatures are necessary to evaporate water and CO2 and perform the actual process in the cement clinker of combining the materials. The clinkering zone is the catalyst that causes the reaction.

The kiln is left at a tilt to allow the materials to go down and the gas (CO2 emission) to travel upward and cut off the kiln.
RECORER REPORT, Chem 444A “Fire & Ice”

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<td>Miriam</td>
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<td>Wandy</td>
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<td>Camily</td>
<td>Reflector</td>
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<td>Eliza</td>
<td>Recorder</td>
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<td>Taylor</td>
<td>Manager</td>
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1) The heat is being insulated because the refractory is preventing and containing the transfer of heat.
2) The molecules are moving further apart because the temperature and pressure up to that point have weakened the attraction between the molecules. This allows the steel to change shape even though it is not yet a liquid.
3) Heat is causing a chemical reaction to harden the pellets. This process takes place in the kiln because it contains the heat in one area. This is necessary to create the base product which will then be transported to different companies.
Within the furnace and the refining furnace, there has to be refracting material. The purpose of this material is to prevent the materials drawn from melting. A good conductor of heat, and it melts at a temperature lower than that is made of the refracting material is next shown. It has to be produced safely without any refracting materials melting.
How Cement is Made

CO₂ Emissions

Raw Materials

Drying Zone

Calcining Zone

Clinkering Zone

2700°F

Fuel combustion

Cement clinker

* Refractory material prevents kiln from melting

* Steel starts creeping at 450°C

* Steel melts at 2730°F

Christopher F. Bauer, Principal Investigator.
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Reduction of Aluminum

- during the process, the kiln/furnace will reach up to 950°C to reduce the Al.

- A refractory is necessary to protect steel construction of chamber contain/withstand such a high temp.
- withstand physical wear
- prevent heat flow out of the system

- heat is used to break apart Alumina so that Al can be reduced.

Potential dangers:
- meltdowns, spills, molten chemicals everywhere
- injury to workers
- inefficiency: heat loss would slow down the process

Christopher F. Bauer, Principal Investigator
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Iron Ore Processing

Mining
Collecting material

Crushing
Reducing size

Mixing
Mix with binding agents

Concentrating
Filtering out silica and sand

Pelletizing
Made into soft pellets and put in kiln to harden

Eliza
Mandy
Emily K
Miriam
Taylor