



11–12 October 2012, Riga

**Riga Technical University
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Dedicated to the 150th Anniversary and
The 1st Congress of World Engineers and
Riga Polytechnical Institute / RTU Alumni

DIGEST

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Silicon Carbide Ceramics Uses in Civil Engineering

Elina Indriksone, Viktors Mironovs (*Riga Technical University, Laboratory of Powder Materials*)

Keywords - Silicon Carbide, Silicon Carbide Ceramics, Silicon Carbide bricks, SiC.

I. INTRODUCTION

Silicon Carbide (SiC) Ceramics has many positive characteristics to compare with other materials and other ceramic bricks. Because of that these advanced ceramics are used as refractory bricks for using in high heat environments such as kilns and furnaces.

The goal of this paper is to characterize the bricks of silicon carbide and define its uses and perspective uses.

II. CHARACTERISTICS

Silicon Carbide is a ceramic material with an outstanding hardness, only surpassed by diamond, cubic boron nitride and boron carbide. The material is highly wear resistant and chemically inert to all alkalis and acids. It is also highly heat resistant. Silicon Carbide refractory is made from high purity refractory grade silicon carbide grains (70.5% of carbon and 29.95% of Silicon) and proprietary ceramic bonds products possess unique combination of physical and chemical properties. High quality refractory brick has a number of traits which distinguishes it from other types of bricks. It can withstand very high temperatures up to 2200°C without failing. It has low thermal conductivity to compare with aluminum and high – to compare with glass and polymers, 50 to 100 W/m²K, and the low coefficient of thermal expansion 5·10⁻⁶/K. In the same time it has relatively low density 3.1-3.3 g/cm³. The hardness can compare to diamond (Mohs hardness 9.25). SiC brick has good tribological properties and high resistance to wear.

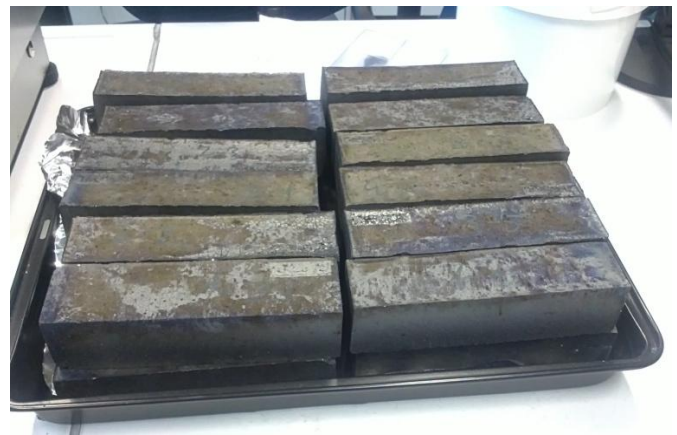
III. USES

Refractory brick can withstand impact from objects inside a high heat environment, and it can contain minor explosions which may occur during the heating process. The places where refractory bricks are used: fireplaces, wood stoves, cremation furnaces, ceramic kilns, furnaces, forges, and some types of ovens. SiC bricks are used in steel and iron smelting, in steel ladle lining, nozzle, stopper, blast furnace bottom and

bosh, iron notch steel notch of rotary furnace and electric furnace and anhydrous cooling slide track. In silicate industry, used as awning and fire insulating material, such as muffle lining and casket alms bowl.

IV. PRACTICAL RESEARCH

A set of ceramic samples based on silicon carbide was studied. Ceramic samples were prepared by sintering fine powder of SiC with particle 0-90µm in size. During sintering such additives as phenol resin and carbon black were used. The sintering temperature varied from 50-70 °C. Sintered samples were in the form (pict.2) of rectangular parallelepiped approximately 170 mm in length, 40 mm in width and 40 mm high.



Picture 1. The specimens of SiC Ceramics

Density of the samples was measured by hydrostatic weighing in distilled water in order to determine characteristics of new SiC Ceramics material.

V. CONCLUSIONS

SiC Ceramics have excellent characteristics for being a refractory material. Refractory bricks are used as light-weight structural materials for high-temperature applications.

Obtained results can be used in the future to make new SiC bricks with specific properties and uses in other fields of civil engineering.