The nano-technology on shapeless refractories. keywords: nano-technology,

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The impact of Nano-technology onrecent advances in shapelessrefractories: A review Heidar Ali* 1Department of MaterialsScience, UNSW University, Australia *Corresponding Author, Tel: +98 9133330848, E-mail address: Abstract: In recent years, the use of Nano-technology(Nano-particles, Nano-material and Nano-additives) has attracted attention ofscholars, engineers, and scientists in all scientific fields such as chemistry, medicine, material, agriculture, electric, and etc. The use of Nano-technologyhas also become widespread in the refractories products (which mainly used byvarious industries suchas steel, casting, cement, glass, and etc.). So, some researchershave examined the effect of using different types and contents ofNano-materials (oxides and non-oxides) on the properties of shaped (bricks) andun-shaped (shapeless) refractoriesproducts and they have attained very interesting results. One of the most consumable refractory goods in different industries is shapeless refractories, which has been widely used because of theirgreat advantages to the other refractories goods (bricks).

Hence, in this research, recent progresses in shapeless refractories by Nano-technology are mentioned. This article can be used as a complete reference and guidance for Scientific’s, students andartisans for easy access to experimental research results of theimpact of Nano-technology on shapeless refractories. Keywords: Nano-technology, Nanoparticles, Refractory, shapeless 1. Introduction: 1. 2.

Nanotechnology (Introduction): TheNano-technology phrase originating from two words consist of the Greek numerical prefix nano referring toa billionth and the technology word1-2. As an outcome, Nano-technology or Nano-scaled technology iscommonly considered to be at a size under 100 nm (a Nano-meter is 10-9 m)1-2. 2. Refractories: 2. 1. Introduction: According to the ASTM C 71, the refractories are a " non-metallicmaterials having those physical and chemical properties that lead to themapplicable for structures or as components of systems that are exposed toenvironments above 538°C 11, 16.

Onthe other hand , some references defined refractories as nonmetallic and in organic material that can tolerate high temperature withoutchanging in their properties (such as physicaland chemical) or 11-13, 16-20. As well as, according to theoperating situation, they should to have highthermal shock resistant, be chemically inert, and have definedranges of thermal conductivityand thermal expansion coefficient 11- 21, 22.
It is obvious that refractories have animportant role in glassmaking, metallurgical, and ceramic crafts, where they are generated into a variety of shapes to line the inside of furnaces or kilns or other tools for producing the materials at high temperatures23-25. Some of the technological and scientificinventions and advances would not have been possible without refractory materials. Producing 1Kgof any metal without utilizeof refractory is almost fully impracticable 26-29.

The background of using refractory materials dates back to as mankind begin to progress metallurgical procedure. Thefirst refractor

raw material was clay. Up to the nineteenth century, refractory goods were made of natural ores, such as magnesite, dolomite stones and clay.

itwas at the end of the eighteenth century and beginning of nineteenth centurythat the basis of modern metal beneficiation, the development of Portlandcement and of modern glass processes started to inflict higher requirements to the refractoryindustry 30-34. The mainmaterials used in theproducing of refractories arebased to Fig. 1 34-36. In recent years, with the changing trends insteelmaking, the high performing shaped refractories are on an increasing request.