The International Journal's
Research Journal of Science & IT Management
ISSN:2251-1563

The Investigation of Some Mechanical Properties of BeO – SiC Composite ceramic

Tarik Talib Issa
Dunia.K.M.Al-Nasrawy
University of Baghdad , College of science, Physics department , Jadiriya ,Baghdad ,IRAQ

Abstract

The behavior of some mechanical properties of BeO-SiC sintered compacts at different sintering temperature of in air were conducted .The resulting data indicated that the combination BeO 95wt.% - SiC 5 wt.% ,sintered at 1300 C^0 ,lead to increasing the hardness ,flexural strength and compression respectively .X –ray diffraction pattern shows nothing changes concerning the crustal structure after the sintering process.

INTRODUACTION

A variety of new ceramics has been developed in the last twenty years . These are of particular interest because they have either unique or outstanding properties and greater chemical receptivity or they have been discovered more or less accidentally and have become an important part of the industry .Most properties ceramics reflect mechanism interdependence of the bond types whether it is covalent bond or ionic .There for ,insulators ,ceramic electrical owns the covalent harmonizing collaborative bond that prevent movement of electrons freely than he needs to high energy to help electrons to move and these are some ceramic heat due energy photons alone without the help of free electrons .Most of the ceramics materials have low atomic weight except zirconium. Sintering is a manufacturing process an which fine powder that has been formed into a shape is subsequently fined at high temperature .More formally ,sintering is a thermal treatment that bonds particles together into a solid . Several studies have been reported on the MgO powder compacts and the effect of dopants and atmosphere an the sintering and mechanical behavior .Clark and Whites. **(1)** The micro structural development of Al2O3-SiC composite ceramics has been studied by K.C. Radford. **(2)**

EXPEREMANTAL WORKS

The materials used were BeO, SiC powder from (BDH , England) ,in the average particle size of (50 – 70) micron , average sphericity 0.59 and surface aria 29 m^2/g . Sic at varying fractions (5,10 and 15)wt.% ,were wait mixed with BeO by using ball milling technique ,spherical marble balls used as milling medium .The milling was achieved in the presence of de ionized water for 10 hours .The mixed powder were dried at 100 c . Disc of BeO ,and BeO-SiC compacts were fabricated and sintered at different sintering temperature ranging from (700 , 1000,1300)C^0 at heating rate $10C^0$/min. ,for 3hurs under static air .X-ray diffraction were performed for the sintered compacts .Hardness ,flexural strength and compression test were tested at room temperature for all sintered compacts discs .

RESULTS AND DISCUSSION

Standard x-ray diffraction analysis were performed for the sintered compacts using the pattern obtained in figure (1) , which analyzed the height of peaks used to identify the phases according to the ASTM (file no.35-0818-BeO) which indicated no any phases changes were observed for all the BeO after adding SiC and sintered at different sintering temperature.

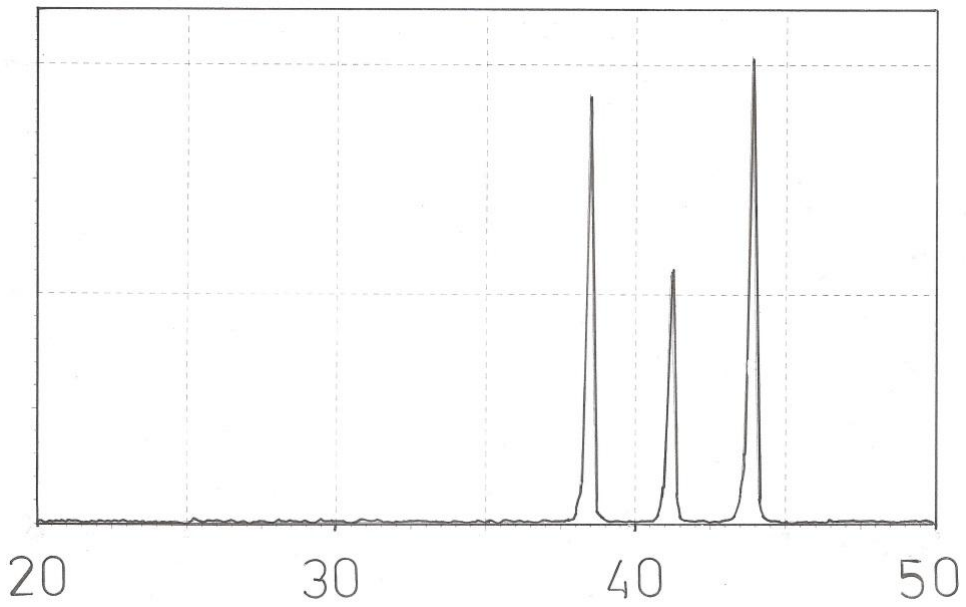

FIGURE1. X-ray diffraction pattern for BeO –SiC compacts Sintered at different sintering temperatures .

Figure (2) shows the hardness behavior of BeO and BeO – SiC ,sintered at different sintering temperature which reflect the increasing in hardness at the combination BeO 95wt.% - SiC 5wt.% ,sintered at 1300 C^0 ,while lowering value was observed at 1000 C^0 for the combination BeO 90wt.% - SiC 10 wt.% . The optimum value of sintering temperature was found to be at 1300 C^0 ,above which the liquid phase caused the destruction of the composite compacts density .This behavior probably an surface related phenomenon**(3**

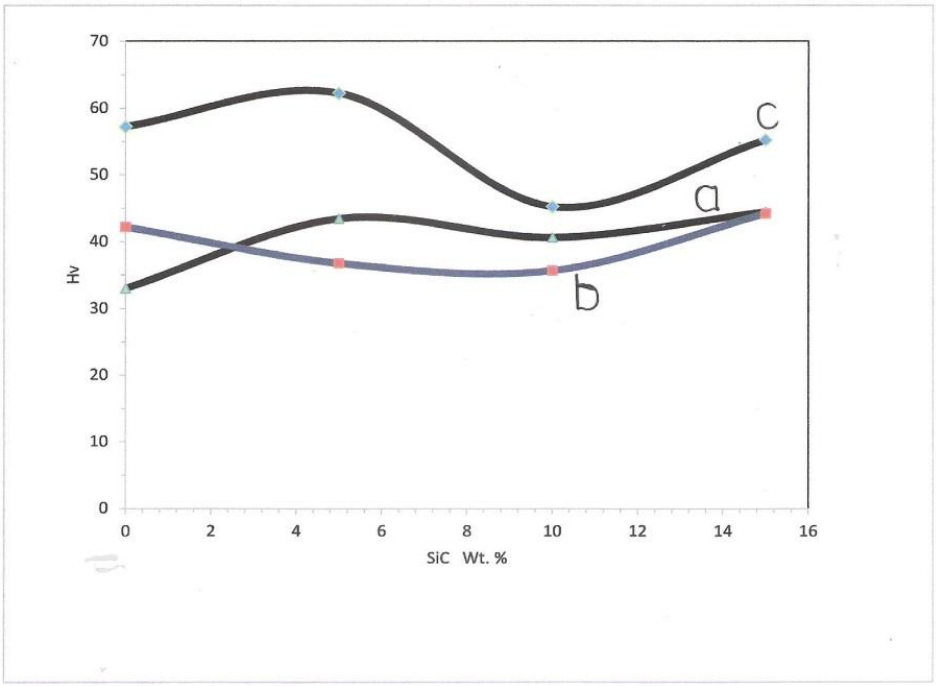

FIGURE2.Vickerhardness for BeO –SiC wt.% compacts Sintered at a) 700 C^0 **, b) 1000** C^0 **, c) 1300** C^0

The flexural strength behavior for all sintered compacts Beo,BeO – SiC ,were tested .Its so clear that the combination BeO 95wt.% - SiC 5wt.% ,having a maximum value at all sintering temperatures and

reaching the optimum value at 1300 C^0. The other combinations ranging between increasing and decreasing as shown in figure (3) .This behavior is a resulting of SiO surface film or trace oxidation that coat the BeO particles and suppression the density .

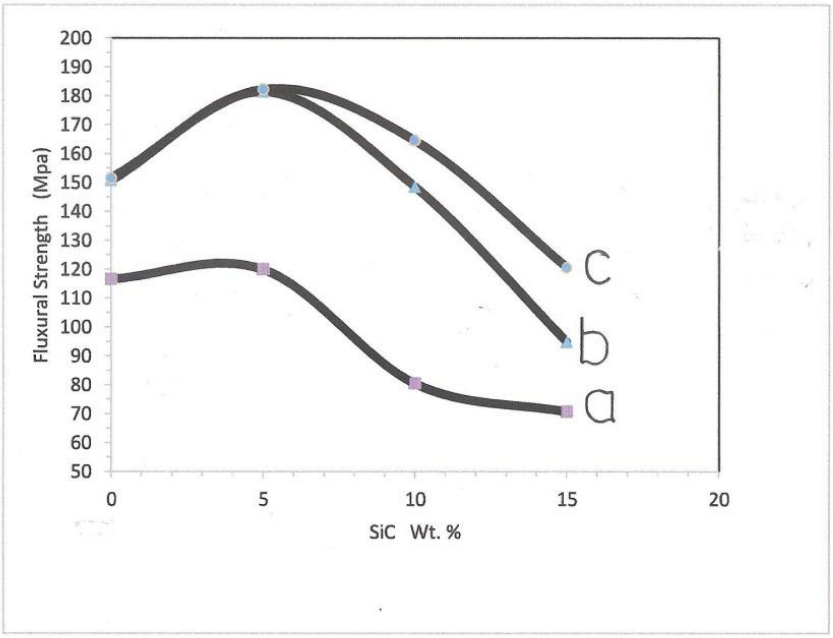

FIGURE3.Room temperature flexural strength for BeO –SiC wt.% compacts Sintered at a) 700 C^0 , b) 1000 C^0 , c) 1300 C^0 .

In the compression strength behavior we can notes the clear increasing for all combinations comparing it with BeO compacts results, and reaching a maximum value at the combination BeO 95wt.% - SiC 5wt.% sintered at 1300 C^0 as shown in figure (4) , which its results consistence with the results showed in flexural strength . However the difference were found between all the results .Its seems that the BeO powder tend to shrink away from the SiC particles during the sintering which lead to that difference [(4) (5)] .

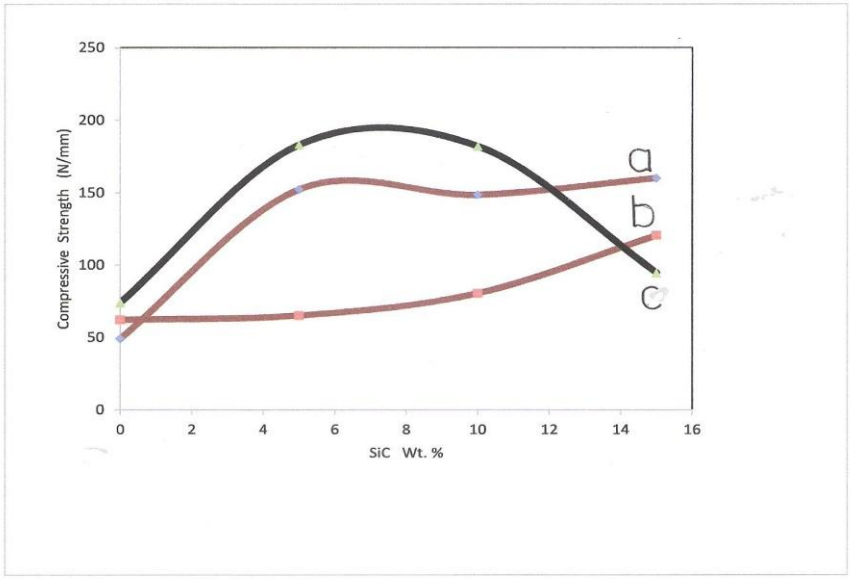

FIGURE4.Room temperature compression strength for BeO –SiC wt.% compacts Sintered at a) 700 C^0 , b) 1000 C^0 , c) 1300 C^0 .

CONCLUSION

X-ray diffraction analysis indicated no any phase changes after sintering for all the combinations . The increasing in hardness , flexural strength and compression strength were observed for the combination BeO 95wt.% - SiC 5wt.% ,sintered at 1300 C^0 for 3 hours under static air . The ranging between other results for the other combinations is a resulting of surface related and particle shrink phenomenon .

REFERENCES

1- P.W.clark and J.White " Some Aspects of sintering " ,Trans.Br.Ceram.Soc.Vol.49.No.7,(1950).P.305 .
2- K.C.Radford. J.Mate.Sci.Vol.81.(1981).P.679 .
3- R.D.Dukino and M.V.Swain ,J.Am.Ceram.Soc.Vol.75.No.12 ,(1992).
4- Gerhard Elssner ,Helmut Hoven ,Gorde kiessler,Radall Wert. " Ceramic and ceramic composites" , H.D.Inc.(2005) .
5- Tarik Talib Issa ."Studying the sintering behavior of BeO x – SiC 1-x Composite Ceramic Material " , AIP American Institute of Physics Conf.Proc. V. 1400.P33 .(2011) .