Studying some mechanical properties of MgO with used neon bulb glass

Tarik Talib Issa, Saba Mahdi Khaleel, and Noura Ammar Abdul Kareem

Citation: AIP Conference Proceedings **1569**, 237 (2103); doi: 10.1063/1.4849267
View online: http://dx.doi.org/10.1063/1.4849267
View Table of Contents: http://scitation.aip.org/content/aip/proceeding/aipcp/1569?ver=pdfcov
Published by the AIP Publishing

Studying Some Mechanical Properties of MgO with Used Neon Bulb Glass

Tarik Talib Issa [a], Saba Mahdi Khaleel [b], Noura Ammar Abdul Kareem [b]

[a] *University of Baghdad , College of science physic department , Material Science group*
[b] *Ministry of Industry and Minerals ,Commission for Research And Industrial Development ,Chemical and petrochemical Research center*

Abstract. Ceramic compact of MgO +WT% of UNBG were sintered at different sintering temperature (700, 900, 1100, 1300)°c , under static air for 3 hours. X-ray diffraction and some mechanical properties were conducted. The maximum sintered density, compression; fracture strength and hardness were indicated for the compilation of MgO -20 WT % UNBG, sintered at 1300 °c.

Keywords: Ceramic, Sintering, Mechanical properties.
PACS: 62.40+ i

INTRODUCTION

The traditional powder ceramic process, often referred to as "press and sinter" (1), new materials (2), and sintering technology continue to broaden the applications and improve the overall quality and competitiveness of powder. Due to the difficulty of Recycling the high cost of assembling and manufacturing requirements such as sand and silica .However, the glass industry of sand is one of the industries, energy-consuming significantly, where you need the manufacturing process to temperatures up to (1600°c) the recycling of glass need to heat energy much less(3), .Glass is a material of more material interest in the world, which makes mainly of sand (silica), soda (carbonate of sodium) and lime (calcium carbonate) and of the glass many uses you can count and can be formulated in various forms, and tons as included in the ceramic industry . Magnesium oxide is one from the most interest material to be used in high temperature electrical insulations (4), thermal binder(5), machine able ceramic (6), …etc.

Experimental work

Analytical reagent – grade MgO powder supplied by BDH Co. , and the UNBG test impurities listed in table number 1.

3rd International Advances in Applied Physics and Materials Science Congress
AIP Conf. Proc. 1569, 237-241 (2103); doi: 10.1063/1.4849267

Used ' Neon Bulb Glass	**Concentration (%)**
pb	0.017%
Na	10.34%
Ca	6.17%
Si	27.3%
Mg	1.64%
Hg	0.25ppm

TABLE.1 The impurities of used neon bulb glass

Pellets were fabricated without used neon bulb glass , then powder for the 10wt% , 15wt% and 20wt% UNBG-MgO specimens were prepared by dry mixing 5g of each was compacted of 4mm thickness .The investigation involved the sintering temperature from(700 ,900 ,1100 , 1300)°c in static air for socking sintering time 3 hours. Densification measurements were based on the volume determined and accurate weight. X-ray diffraction analysis was performed for the sintering specimens. The patterns obtained were analyzed and the high of the x-ray diffraction peaks was used to represent the phases formed according to the ASTM. Compression test , fracture strength test and Vickers hardness test were done at room temperature for all samples sintered at different sintering temperature.

RESULTS AND DISCUSSION

Standard x-ray diffraction technique was used to determine the crystalline phase present in the fabricated bodies. For all compacts sintered at 1300°c , the major phases detected are related to the used neon bulb glass with a minor phase of MgO was indicated from the high intensity reflection at 20(deg)=42° as shown in figure (1).

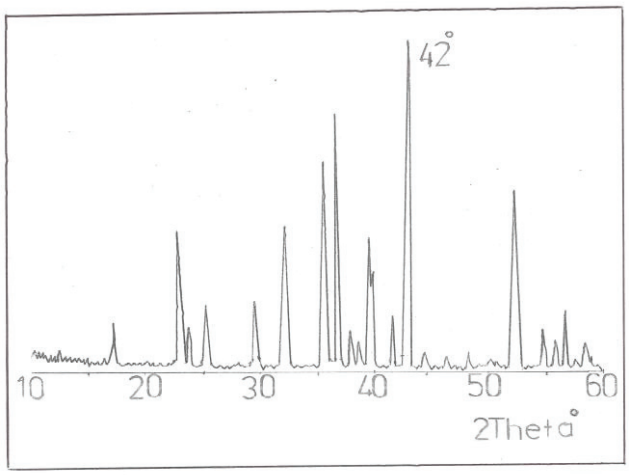

FIGURE 1. X-ray diffraction pattern for MgO –UNBG20 wt.% compact Sintered at 1300 C° in air.

The improvement in the mechanical properties of MgO(4), after adding the UNBG were indicated for all the combination (10 ,15,20) wt.% UNBG having its maximum value for the MgO- 20Wt.% UNBG , sintered at 1300 °c . As shown in figure 2, 3, and 4 respectively. This improvement is due to the formation of the glass liquid phase(7).

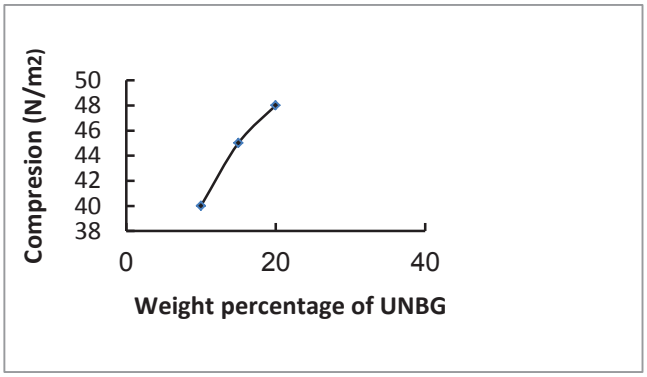

FIGURE 2. The compression test for the MgO – UNBG Wt. %, sintered at 1300 °c in air.

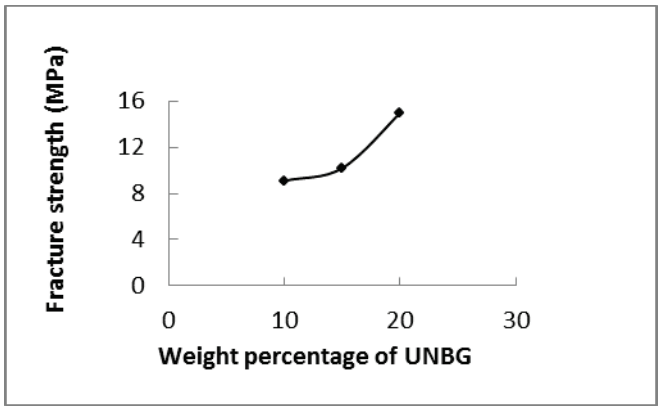

FIGURE 3. The Fracture strength test for the MgO – UNBG Wt.% ,sintered at 1300 °c in air.

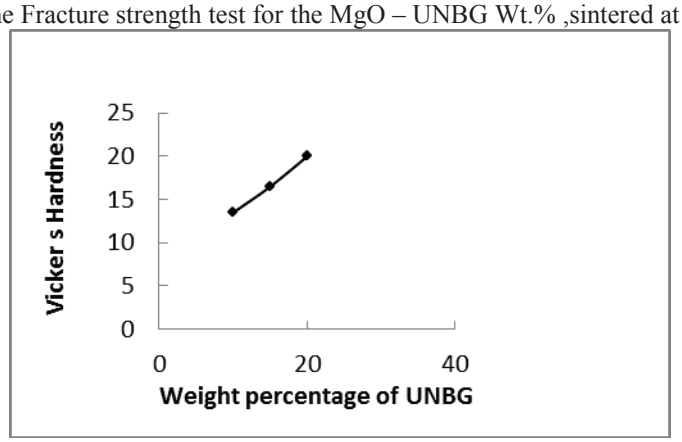

FIGURE 4. The Vickers Hardness test for the MgO – UNBG Wt.% ,sintered at 1300 °c in air .

CONCLUSION

Formation the glass liquid phase with the combination MgO – 20wt% UNBG ,sintered at 1300 for 3 hours under static air , showing a highly mechanical results than the others combinations MgO - (10 ,15) wt % UNBG sintered at (700,900, 1100) °c .

ACKNOWLEDGMENTS

The externally grateful to the all people that support and facilities offered throughout this work. Specially the material lab in the University of Technology.

REFERENCES

1. M De Garmo, E.P., Black, J.P., kosher, R.A. " Materials in Process in Manufacturing " 6th edition,(1984) ,Macmillon Publishing Company.
2. G.Burney ,"New Materials and their Applications " , IOP Publishers, England (1988) .
3. W.D.Callister, Jr. "Materials Science and Engineering " ,An Introduction , J.W.And Sons, Inc.(1994), U.S.A

4. Tarik.Talib.Issa , and etl ."The investigation of some physical and electrical properties of Mgo with used bulb glass " AIP Conf.Proc. 1476,274 – 278 (2012)
5. Tarik.Talib.Issa ,Talib k. Ibrahim " Manufacturing thermal ceramic binder " ,Patent no. 2820 ,(2001), IRAQ .
6. Tarik.Talib.Issa " Tarik.Talib.Issa ,Talib k. Ibrahim " , Manufacturing machine able ceramic material from composite ceramics . Patent no. 2875 (2001), IRAQ .
7. Gerhard Elssner ,Helmut Hoven , Gorde Kiessler, randall Wert. " Ceramic and ceramic composites " H.D .Inc. (2005).