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Influence of The Firing Temperature on the Illite Clay Ceramic Foam With Waste Glass Powder Addition

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INTRODUCTION

Utilization of local natural resources for production the new type of innovative material and the reuse of domestic and industrial wastes is one of the actual issues. Clay is one of the most available and cheap natural resources for the production of construction and insulation materials. The problem of waste material reuse, particularly glass, is increasing every year. In EU approximately 9 million ton of waste glass (WG) was collected in 2010. During the past decades various manufacturing methods have been investigated and developed for production of porous ceramics, such as the water-oil emulsion, replica, sacrificial template, and the direct foaming. The direct foaming is one of the fastest and easiest methods for producing of the foamed ceramics, however, number of studies devoted to the clay foam producing via direct foaming method is limited.

EXPERIMENTAL METHODS

Clay ceramic foam (CCF) with milled waste glass (soda-lime glass) was obtained using Devon clay from *Lode Ltd*, Latvia. For clay and WG effective mixing the high velocity disintegrator was used. For the clay-WG slurry obtaining high speed mixer disperser at 6000 rpm speed was used. Obtained CCF with 5, 7, and 10 wt% of WG loading were fired at 900, 950, 1000 and 1050 °C temperature. The compressive strength was determined using Universal Testing Machine (Instron: 8801), 7 parallel tests for each sintering temperature and WG content. The specific gravity and water absorption were determined by Archimedes method.

RESULTS AND DISCUSSION

The experimentally obtained CCFs have uniform pore distribution (Fig.1.), porosity rate of 65-76% and compressive strength rate of 3.8-14.3 MPa. The highest rate of porosity (76%) was found for CCF with 10% content of WG sintered at 900 °C

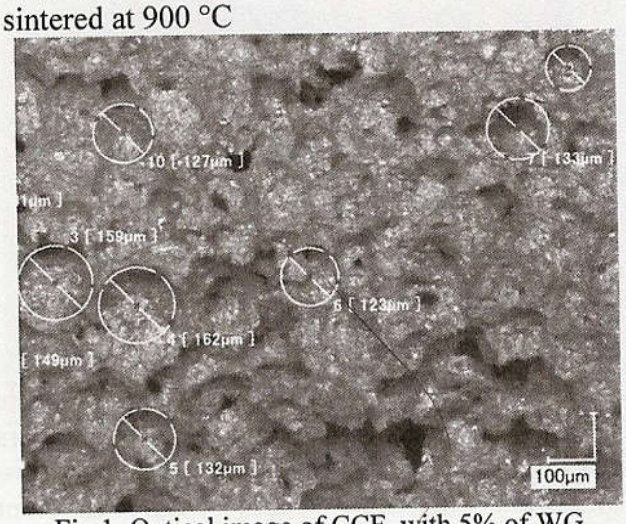

Fig.1. Optical image of CCF, with 5% of WG, sintered at 900 °C

Pores are interconnected and average window diameter is 70 µm. The WG addition had no significant influence on foam morphology and average cell sizes, which were in the 50-200 µm range for all samples sintered at same temperature.

CONCLUSION

Increase of firing temperature from 900 °C to 1050 °C lead to porosity decrease up to 6-7% for all compositions. Increase of WG addition ratio from 5 to 10 % increased porosity for 4-6%, depending on firing temperature. Compressive strength increased for all compositions, and the most pronounced results were found for compositions with 5% of WG content - 4 to 13.8 MPa.

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