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CAVITATION OF REFRACTORY SAMPLES BASED ON TALC AND ZEOLITE FROM ZLATOKOP, SERBIA

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ABSTRACT

Samples based on talc with 15 % of zeolite from Zlatokop, Serbia, sintered at 1200 ºC were prepared and tested in condition of cavitation erosion. The ultrasonic vibratory cavitation set up with stationary specimen was used. Mass loss was measured and degradation level of the samples using image analysis and Young modulus of elasticity was monitored. Obtained results showed good resistance to the cavitation erosion giving the possibility of future application in different conditions where cavitation erosion is expected.

1. INTRODUCTION

Zeolite is widely used for different applications in medicine, chemical engineering, metallurgy, removal of heavy metals from nuclear, mine and industrial wastes [1, 2 , 3, 4], in agricultural for soil conditioner and animal feed supplement [5]. Many authors were investigated zeolite deposits in Serbia [6, 7, 8] and their possible application.
Cavitation erosion is phenomenon which could be observed where the fluid which is transported with some velocity is in the contact with engineering material. Cavitation transport phenomena are well described in the literature, and mostly related to the metallic materials [8, 9, 10, 11]. In this paper material based on talc with 15% zeolite from Zlatokop, Serbia deposit, synthesized and sintered at 1200 °C will be investigated in cavitation erosion conditions.

2. MATERIALS

Sample was prepared as a mixture of talc and 15 % zeolite from Zlatokop deposite. Samples were pressed and sintered under the following conditions: raising the temperature to 1000 ºC

with a heating rate of 5 ºC/min, then heating to 1200 ºC with heating rate of 2 ºC/min with dwell time of 1 hour; cooling of the sample was carried out within the oven.
XRD and SEM of the sample sintered at the conditions given above are given at the Figure 1.

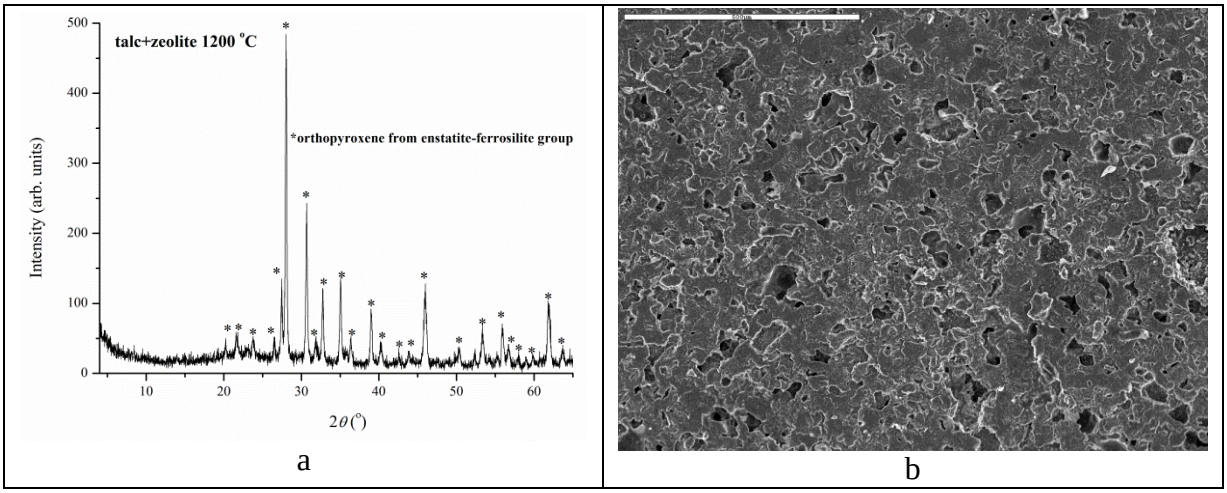

Figure 1. XRD (a) and SEM (b) of the sintered sample

3. EXPERIMENTAL PART

Cavitation resisance was investigated according to the ultrasonic vibration method (with stationary sample) applying water flow (5-10 ml/s) according to ASTM G32 standard [12]. Mass loss was used to determine the degradation of sample. Additionally, samples were photographed, and image analysis was performed for determination of the surface degradation level. Young modulus of elasticity was determined based on UPVT (ultrasonic pulse velocity method).

4. RESULTS AND DISCUSSION

Image of the sample and mass loss during the cavitation testing are given in the Figure 2. As can be seen, after 80 minutes degradation ring which corresponds to the area of the horn was observed. Mass loss results indicated that during the experiment degradation of sample was increasing almost linearly.
Aditional determination of the degradation level was applied using image analysis for surface degradation and Young modulus of elasticity for volume degradation of the sample. Obtained results are given at the Figure 3. According to the results, after 80 minutes the surface degradation level reached 12.76%, while the Young modulus of elasticity decreased for 48 % from the value before experiment.

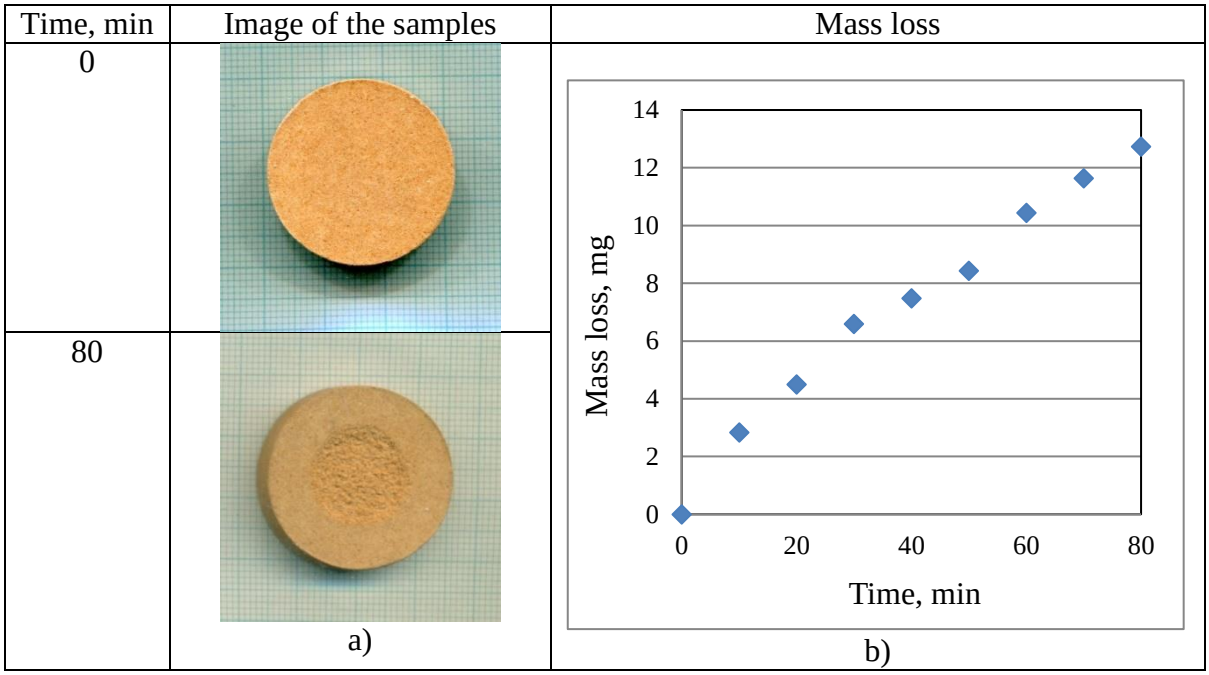

Figure 2. Image of the samples (a) and mass loss during testing (b)

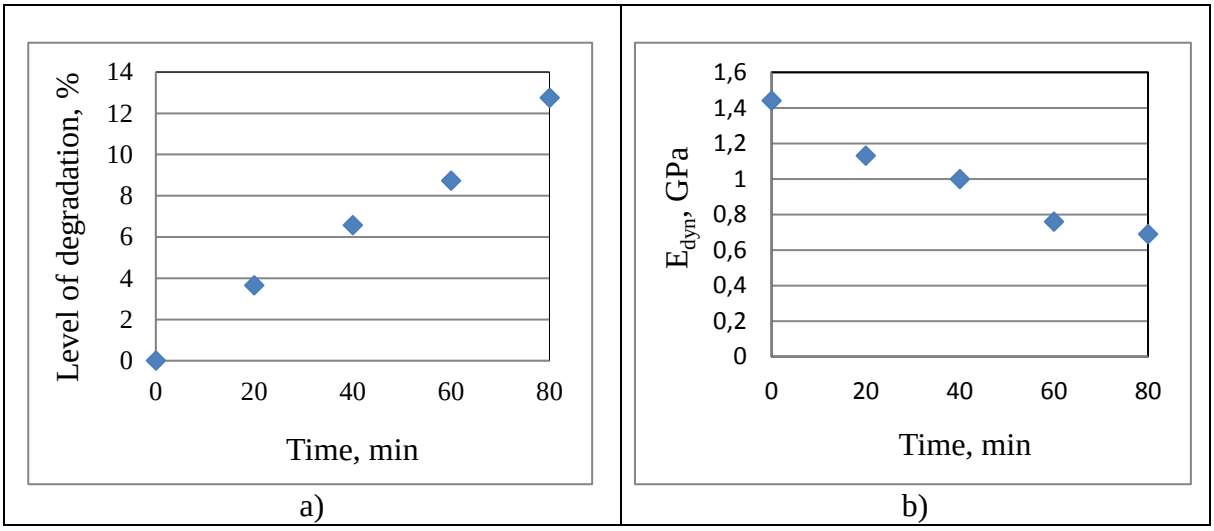

Figure 3. Level of degaradation (a) and Young modulus of elasaticity during the tesing (b)

5. CONCLUSION

In this paper cavitation erosion of sample based on talc and zeolite was investigated. Different methods were used for monitoring behavior of the sample in these conditious:
- mass loss,
- image analysis for surface level degradation and
-Young modulus of elasticity measurements for volume degradation.
According to used approach, for overall insight it is recommended to apply those three methods.

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6. LITERATURE

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