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INVESTIGATION OF RESPONSE TO DC EXCITATION IN AMORPHOUS AND RELAXED BINARY ZrCu SYSTEMS

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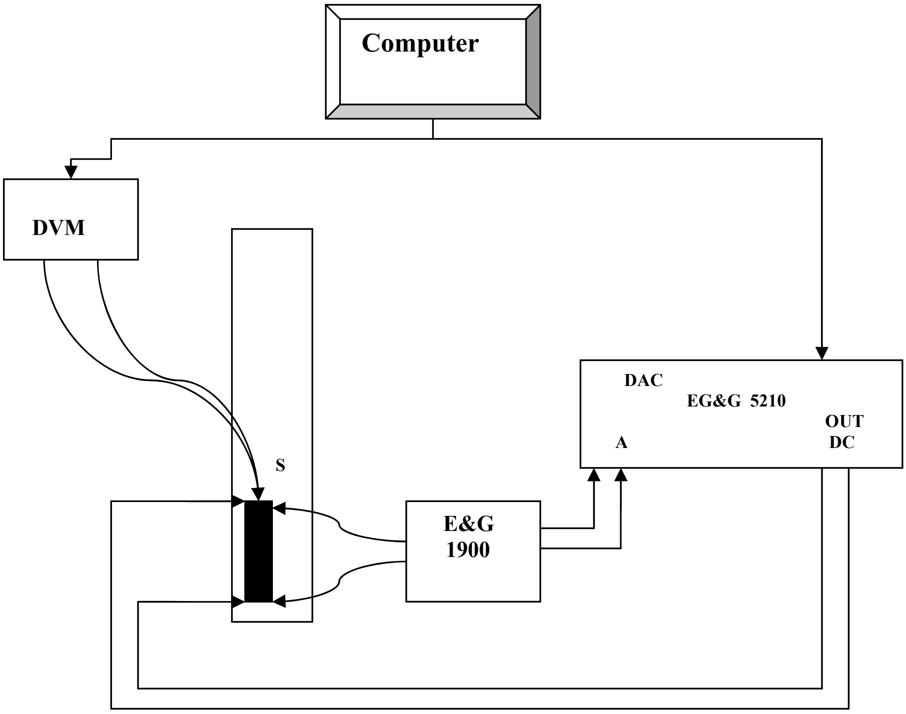
ABSTRACT
This paper examined the response of amorphous binary and relaxed ZrCu systems to dc excitation. The tests were conducted in temperature range from 85K to 285K.
Amorphous systems were relaxed at temperature 473K for 5 hours on the air.
The goal was to determine whether the systems have less amorphous after annealing and determine whether that is the assumption that the amplitude response decreases with the samples warming
The research is fundamental, i.e. belongs to physics of the solid state.
The obtained results are presented graphically.
Keywords: Amorphous Metallic Alloys, ac Excitation

1. INTRODUCTION
In this paper the relaxation processes in binary paramagnetic amorphous metallic Zr49Cu51, Zr40Cu60 and Zr35Cu65 systems are examined using method of DC excitation by monitoring the response of the systems depending on the temperature in interval from 85K to 285K.
After that the samples are annealed in the air in the temperature of 473K during the five hours. Testing response of relaxed systems to dc excitation was carried out in the same temperature interval.
As the electrical resistance of amorphous metal systems decreases with increasing temperature until the temperature of katalization [1], it is expected that the amplitude of the response of the system in DC impulse decline with warming of the sample.

2. EXPERIMENT
In laboratory of physic of metals at the Natural-mathematical faculty in Sarajevo the alloys Zr35Cu65 (Zr: 35 at.%; Cu: 65 at.%), Zr40Cu60 (Zr: 40 at.%; Cu: 60 at.%), Zr49Cu51 (Zr: 49 at.%; Cu: 51 at.%) were produced in vacuum electric arc furnace in argon atmosphere. Then the amorphous tapes were produced from that alloys using melt-spinning method [2]. Dependence the response of the systems on the temperature is tested very sensitive method which is shown in Figure 1: EG&G 5210 lock-in amplifier –is used as a source of ac signals having voltage 1V and current of 1mA, then as a source of dc voltage from 1V to 15V and as an instrument for measuring of output voltage signal from sample with sensitivity from 3V to 1nV, DVM-Keithley – instrument for measuring voltage with a precision up to the sixth decimal of the temperature, EG&G 1900-transformator – amplifier which amplifies a signal from 10 to 1000 times, working frequency is 28,4Hz, S – sample..



Slika 1. Shematski prikaz sistema za mjerenje odziva uzoraka na dc pobudu u ovisnosti o temperaturi.

3. RESULTS

The figures 2,3,4 and 5 are showing the results of the measurements. Conclusions are made based on those results.

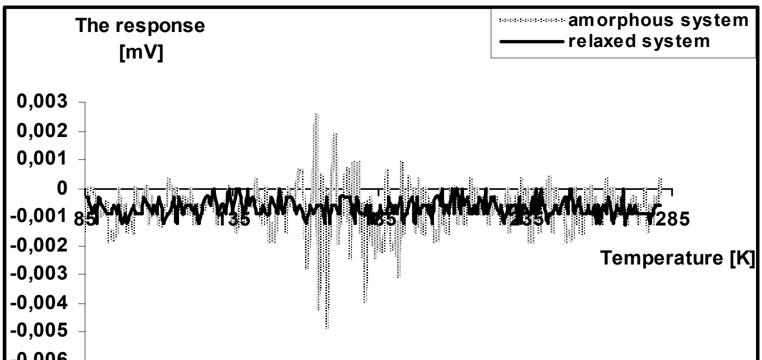


Fig. 2 Response to dc excitation of the amorphous and relaxed Zr49Cu51system as a function of temperature

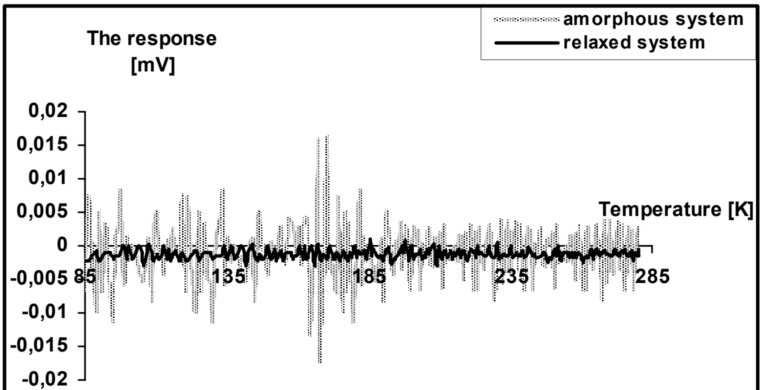


Fig. 3 Response to dc excitation of the amorphous and relaxed Zr40Cu60 system as a function of temperature

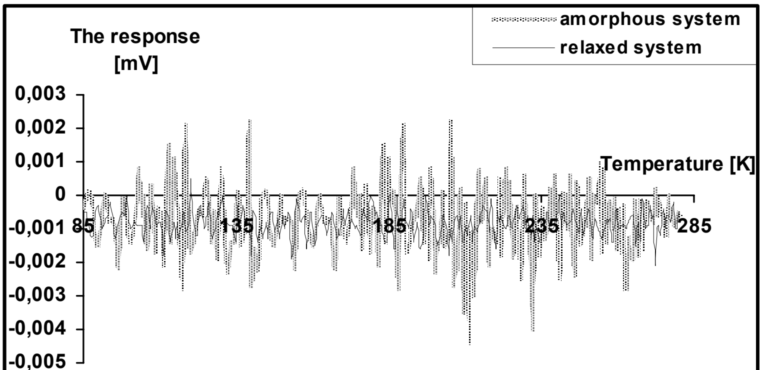


Fig. 4 Response to dc excitation of the amorphous and relaxed Zr35Cu65 system as a function of temperature

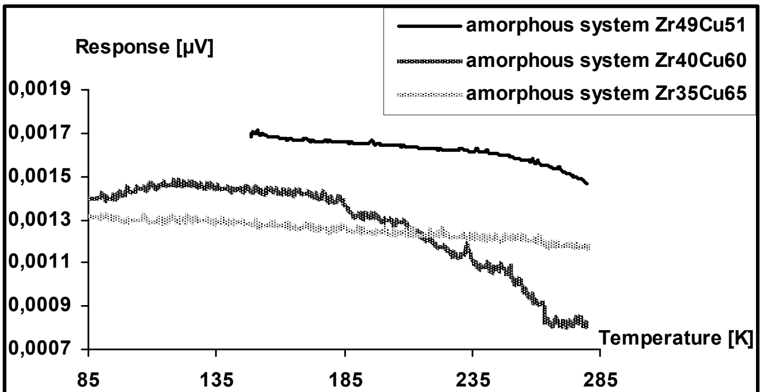


Fig. 5 Response system to ac excitation as a function of temperature

4. CONCLUSIONS

1. Systems retain their amorphous after annealing (fig. 2,3,4).
2. Amorphous of the relaxed systems is decreased in comparison to systems that are not annealed (fig. 2,3,4).
3. The amplitude of the response of the system in DC impulse declines with warming of the sample which is in conformity with the assumption and it can be seen from the comparison of the results given in Figure 2,3,4 and Figure 5.

5. REFERENCES

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