

Electric Properties of Step-up Piezoelectric transformer by dimension variation

Hyeonkyu Joo, Insung Kim, Soonjong Jeong, Minsoo Kim, Jaesung Song and Vietthang Vo*
 Korea Electrotechnology Research Institute, University of Science and Technology*

Abstract : In this study, in order to develop high power piezoelectric transformer, we compared the piezoelectric transformers dimension. The basic composition of piezoelectric ceramics is ternary $0.01\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.08\text{Pb}(\text{Mn}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.91\text{Pb}(\text{Zr}_{0.505}\text{Ti}_{0.495})\text{O}_3$. The voltage step up ratio of piezoelectric transformer showed the maximum value at the near of 81 kHz and increased according to the increase of load resistance.

Key Words : Piezoelectric transformer, Dimension, step-up ratio

1. Introduction

The piezoelectric transformer can be miniaturized to a greater degree since the energy stored by the elastic vibration is larger than in the electromagnetic transformers, because the piezoelectric transformers are nonflammable, there are no wire windings and not danger with regard to potential short circuiting of the output part. In addition, magnetic shield is not necessary in piezoelectric transformers and low-profile, high efficiency and excellent power density compared to conventional electromagnetic transformers[1-2].

In this study, in order to find high power properties, we fabricated piezoelectric transformers under varying dimension conditions.

2. Experimental

The Rosen type Piezoelectric transformer were sintered at temperature of 1250°C. The sintered material was fabricated as Rosen-type piezoelectric transformers with the size of 49×9.0×1.5mm, 49×9.0×3.0mm, 49×13×1.5mm, 49×13×3.0mm, respectively. The pasted with Ag, and finally heat treated at 700°C for 10 min. The piezoelectric transformers were poled at 120°C for 30 min by applying field of 3 kV/mm in silicone oil bath.

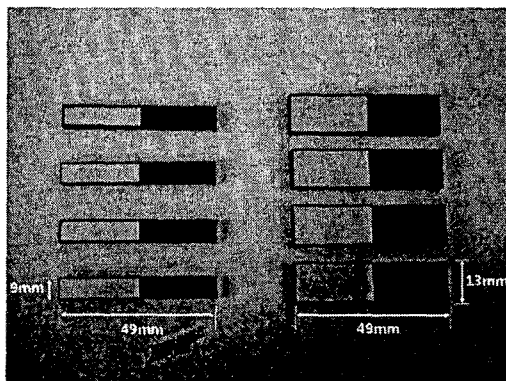


Fig 1. piezoelectric transformer of various dimension

Figure I shows fabricated piezoelectric transformer of various dimension using PNN-PZN-PZT ceramics.

3. Results and Discussion

Figure 2 shows the output power of the piezoelectric transformer as a function of input voltage and varying dimension at 150 kΩ matching impedance after driving for 20 min.

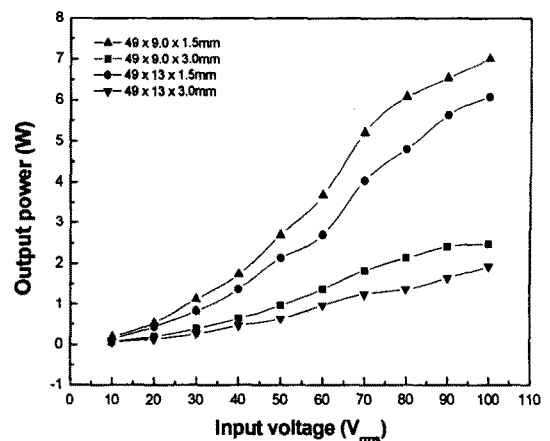


Fig 2. Voltage output power according to input voltage and varying dimension.

The manufactured piezoelectric transformer could be used up to 7 W at 150 kΩ with the size of 49×9.0×1.5mm.

4. Conclusion

In this paper, Rosen type piezoelectric transformers with high quality have been successfully manufactured using $0.01\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.08\text{Pb}(\text{Mn}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.91\text{Pb}(\text{Zr}_{0.505}\text{Ti}_{0.495})\text{O}_3$ ceramics. The piezoelectric transformer applied matching impedance of 150 kΩ, the output power of 7 W were measured.

Reference

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