Fe$_2$O$_3$가 첨가된 Pb(Ni$_{12}$Nb$_{23}$)O$_3$ - PbTiO$_3$ - PbZrO$_3$ 세라믹의 바이모프 액츄에이터를 이용한 에너지 하베스팅

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Energy Harvesting from the Bimorph Actuator using Fe$_2$O$_3$ Added Pb(Ni$_{12}$Nb$_{23}$)O$_3$ - PbTiO$_3$ - PbZrO$_3$

Ceramics

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Abstract: Fe$_2$O$_3$ added Pb(Ni$_{12}$Nb$_{23}$)O$_3$-PbTiO$_3$-PbZrO$_3$ (PNN-PT-PZ) ceramics were produced in order to use them as a bimorph actuator for energy harvesting. Especially, the 0.25 wt% Fe$_2$O$_3$ added 0.4PNN-0.357PT-0.243PZ, having the composition of morphotropic phase boundary, showed good piezoelectric properties of $d_{33}$ of 810 pC/N, $k_p$ of 77% and $Q_m$ of 55 along with a high Curie temperature of 210$^\circ$C. A bimorph actuator, composed of the two piezoelectric layers bonded together with a phosphorous bronze layer as a central metallic electrode, was successfully fabricated. The bimorph actuator, vibrated with a 1.3 mm amplitude at 68 Hz, produced high electric power of approximately 60 mW.

Key Words: PNN-PT-PZ ceramics, bimorph actuator, energy harvesting, piezoelectric properties