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Elektrische Ermüdung in Funktionswerkstoffen

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Electric-Field-induced Strain Behavior in Bi-based Ceramic Composites

Electromechanical strain realized by electric-field-induced phase transition is one of the important mechanisms involved in electromechanical performance of actuation materials. Several studies have revealed that high strain levels in bismuth-based ceramics occur upon application of an electric field over 60 kV/cm, suggesting the possible replacement of lead-containing materials in actuator applications. The application of such a high electric field to bismuth ceramics, however, is a drawback for use in practical applications. In this study, a potential approach is proposed in which an electric-field-induced phase transition in bismuth-based ceramics is used at a relatively lower field of 20~40 kV/cm.

This talk will discuss the electrical properties and the electric-field-induced strains of $Bi_{1/2}(Na_{0.8}K_{0.2})_{1/2}TiO_3$ (BNKT) and $0.99[Bi_{1/2}(Na_{0.75}K_{0.25})_{1/2}TiO_3]$-$0.01BiAlO_3$ (BNKTBA) single-particle-added $Bi_{1/2}(Na_{0.75}K_{0.25})_{1/2}TiO_3$-$BiAlO_3$ (BNKT-BA) ceramics. The mixture of ferroelectric BNT and relaxor BNKT-BA were fabricated by a solid state reaction. High strains of 0.3 % ~ 0.4 %, as compared to $0.94[Bi_{1/2}(Na_{0.75}K_{0.25})_{1/2}TiO_3]$-$0.06BiAlO_3$ (BNKT-BA) ceramic, were observed in compositions with 20% BNKT and BNKTBA, which is a diphasic composite comprising ferroelectric BNKT and/or BNKTBA grains and relaxor BNKT-BA grains. This enhanced electromechanical strain was attributed to the coupling of the transition from relaxor to ferroelectric phases in BNKT-BA small grains with a non-180 ^{o} domain reorientation in BNKT and BNKTBA large grains during external electrical cycles. The maximum dynamic d_{33}^{*} values of BNKT-BA with 20% BNKT and BNKTBA single particles were 900 pm/V at 40 kV/cm and 500 pm/V at 30 kV/cm.

Die Vortrag findet um **16:15 Uhr** im Gebäude der Materialwissenschaften, Lichtwiese, Alarich-Weiss-Str. 2, **Raum 77** statt