Programme & The Book of Abstracts

Seventeenth Annual Conference

YUCOMAT 2015

Herceg Novi, Montenegro, August 31 – September 4, 2015

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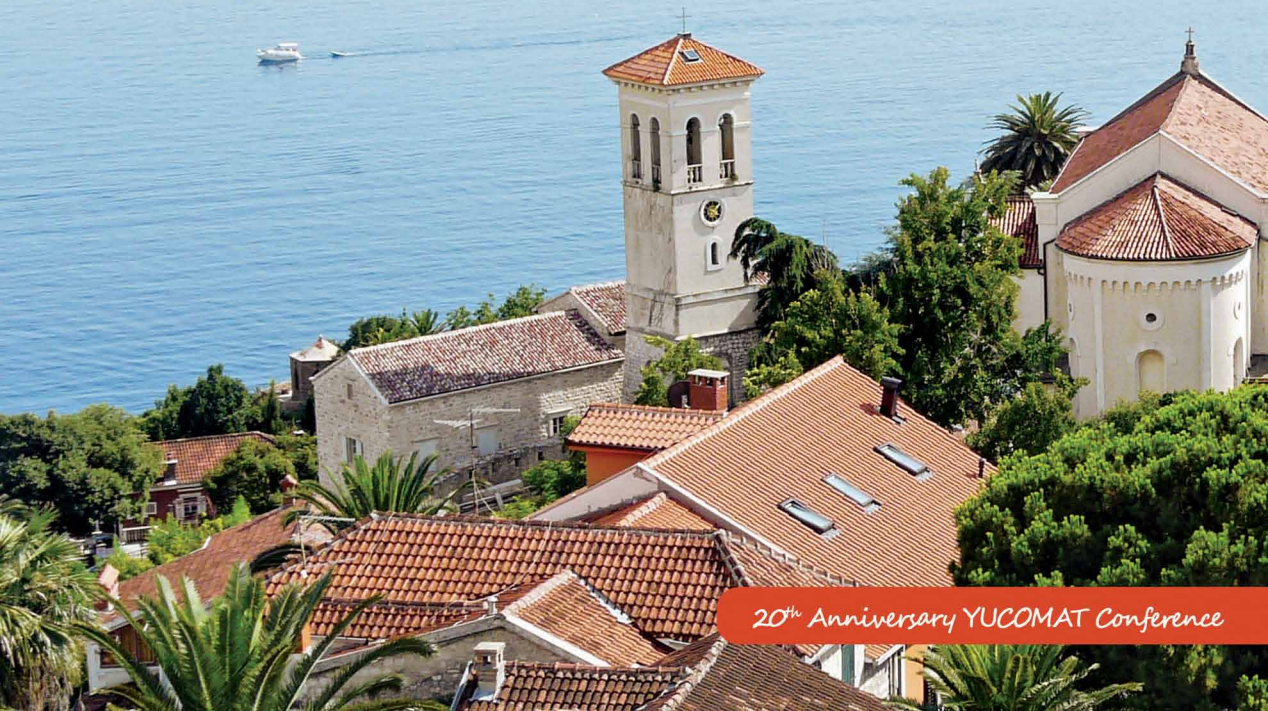

20th Anniversary YUCOMAT Conference

SEVENTEENTH ANNUAL CONFERENCE

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Influence of Sintering Atmosphere on the Crystal Structure, Microstructure, Dielectic and Optical Properties of $BaTi_{1-x}Sn_xO_3$ (x = 0, 0.05 and 0.1) Ceramics

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Due to specific dielectric and ferroelectric properties, functional ceramics based on barium titanate ($BaTiO_3$) have found application in semiconductor industries. Appropriate electrical properties of barium titanate-based materials, such as magnitude of relative dielectric permittivity and the Curie temperature, can be achieved by varying sintering conditions (which influenced ceramics' microstructure) and/or by doping with various cations.
In this study, we investigated the influence of sintering atmosphere (air and argon) on the crystal structure, microstructure, dielectric and optical properties of barium titanate-stannate (BTS; $BaTi_{1-x}Sn_xO_3$) ceramics. The BTS powders (with x = 0, 0.05 and 0.1; denoted BT, BTS5 and BTS 10, respectively) were synthesized by the solid-state reaction technique. The powders were subsequently uniaxially pressed (P = 240 MPa) into cylindrical compacts (ø 6 mm and h ≈ 2 mm) and sintered in SETSYS TMA (Setaram Instrumentation, Caluire, France). Sintering experiments were performed at a heating rate of 10 °/min up 1420 °C and with a dwell time of 2 hours; to determine the influence of sintering atmosphere, two sets of experiments were performed: (1) in air, and (2) in Ar. During sintering, the shrinkage was recorded in the axial (h) direction. The crystal structure of the BTS ceramics was studied at room temperature by X-ray diffractometry and Raman spectroscopy. The microstructure and chemical (Ti/Sn) composition were examined by SEM–EDS methods. The electrical measurements were made in air, at 1 kHz using a Wayne Kerr Universal Bridge B224; the measurements were done in cooling, from 160 to 20 °C. For optical characterization UV-Vis diffusive reflectance and photoluminescence spectroscopy were employed. A profound effect of an argon atmosphere on the examined properties of the sintered BTS ceramics has been found; the mostly important is an increase of the magnitude of relative dielectric permittivity.