Investigating the Effects of Uniaxial Pressure on the Preparation of MgTiO3-CaTiO3 Ceramic Capacitors for MRI Systems

Zaineb JEBRI[1], MAHFOUDH Taleb Ali[1], and Isabelle BORD-MAJEK[1]

[1]Universite Bordeaux I

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Abstract

Today's healthcare system relies on MRI (medical resonance imaging) for early diagnosis and treatment planning. For open MRI systems to achieve resolutions of about a hundred microns, a high voltage is required, as well as a specialized power supply. NP0 (Negative-Positive-Zero) ceramic is selected for the fabrication of adjustable capacitors. Specifically, it stands for which is a classification based on the temperature coefficient of capacitance (TCC) of the ceramic material used in the capacitor. NP0 capacitors have a TCC of 0 ±30 ppm/°C, which means that their capacitance value does not change significantly with temperature and frequency. They are known for their stability and low losses, making them ideal for applications that require high accuracy and reliability, such as timing circuits for RF applications. In this paper, MgTiO-CaTiO ceramic is used to make an adjustable capacitor with desired properties for MRI systems. To enhance the dielectric properties of MgTiO3 ceramics,CaTiO3 was added in varying concentrations. After pressing and sintering, the resulting samples were tested using a vector network analyzer in the frequency range of 10 MHz to 130 MHz.The adjustable capacitor fabricated using high co-fired NP0 ceramic may have been used for MRI applications such as tuning circuits and matching networks, where precise capacitance values and low loss are critical[1]. MRI systems with resonance frequencies of 128 MHz require trimmers with ceramic cores.

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3. Names of all authors in the same order as mentioned in ScholarOne

Zaineb JEBRI
Mahfoudh TALEB ALI
Isabelle BORD-MAJEK

4. Author's contribution

This section outlines the specific contributions of each author to the research project. Based on the information provided, the author contributions for the manuscript would be:

Zaineb JEBRI: Worked primarily (during her doctoral and post-doctoral work) on passive components, particularly on the materials used (dielectric = ceramics).

Mahfoudh Taleb Ali: Assisted with the measurements and mechanical characterization of the ceramic.

Isabelle Bord-Majek: Provided project supervision and revision as the supervisor of Zaineb Jebri's doctoral project.

5. Affiliation of all authors

Zaineb JEBRI
Evaluation of Micro and Nano-Assembled Devices, IMS -Talence, France

Frequency Tuning Components Department, Exxelia Temex - Pessac, France

Isabelle BORD-MAJEK
Evaluation of Micro and Nano-Assembled Devices, IMS -Talence, France

Mahfoudh TALEB ALI
DuMAS - DUrabilité des Matériaux, des Assemblages et des Structures, I2M -Talence, France

6. Postal and E-mail address of the corresponding author

Zaineb JEBRI

UMR 5218 - IMS - Laboratoire de l'Intégration du Matériau au Système

351 Cours de la libération, 33405 Talence cedex, France.

jebri.zeineb1991@gmail.com

Isabelle BORD-MAJEK

UMR 5218 - IMS - Laboratoire de l'Intégration du Matériau au Système

351 Cours de la libération, 33405 Talence cedex, France.

maisonduzeste@gmail.com

isabelle.bord-majek@ims-bordeaux.fr

Mahfoudh TALEB-ALI

2M - UMR 5295. Université de Bordeaux - Bât A11. 351 Cours de la Libération 33405 TALENCE CEDEX

talebalimahfoudh@gmail.com

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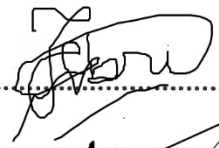
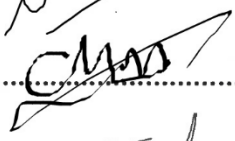
Zaineb Jebri		06/04/2023
Mahfoudh Taleb Ali		06/04/2023
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