Sintering of $BaTiO_3$ Sol Gel / Oxide Powder Composite Thick Films by SLS (Selective Laser Sintering)

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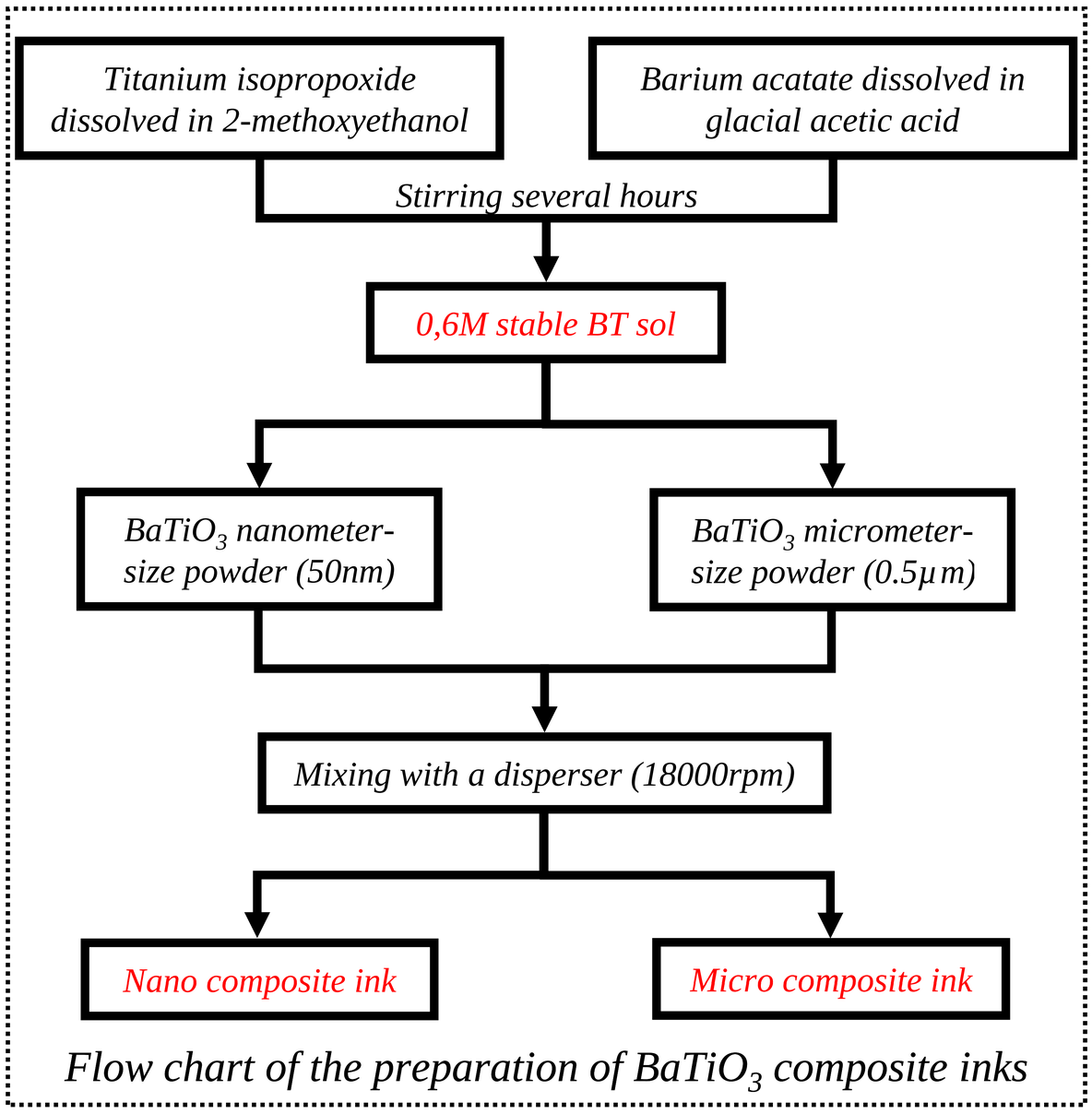
Introduction

The purpose of this work is to obtain a microelectronic component by the mean of a laser treatment. Ferroelectric $BaTiO_3$ thick films were prepared on alumina substrates with a new kind of inks named composite inks by two techniques: screen printing and spin coating. The sintering of the as-obtained films under selective laser irradiation are investigated.

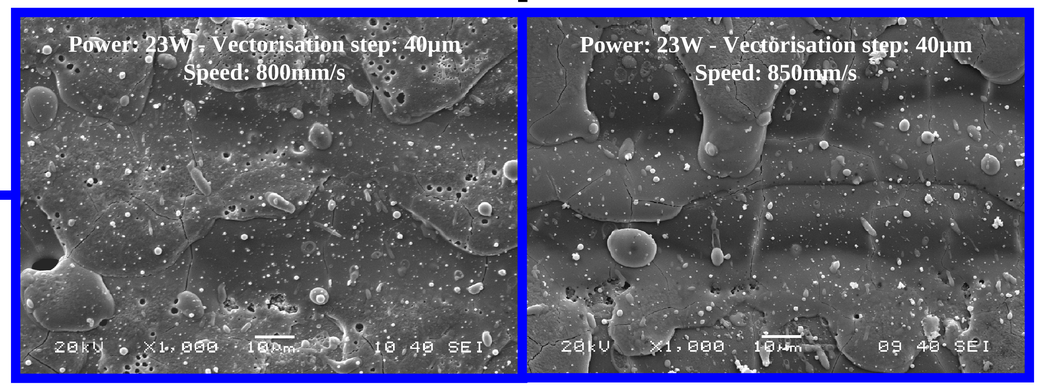


Flow chart of the preparation of $BaTiO_3$ composite inks

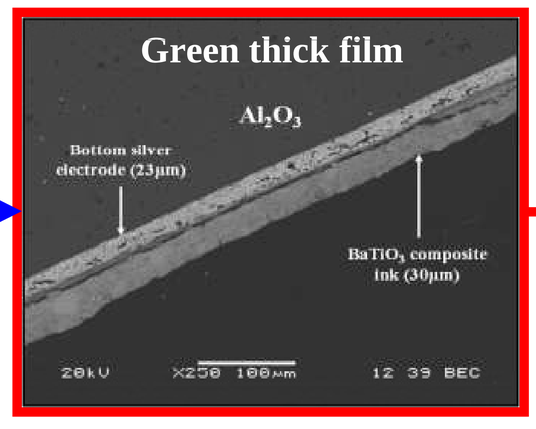
Spin coating

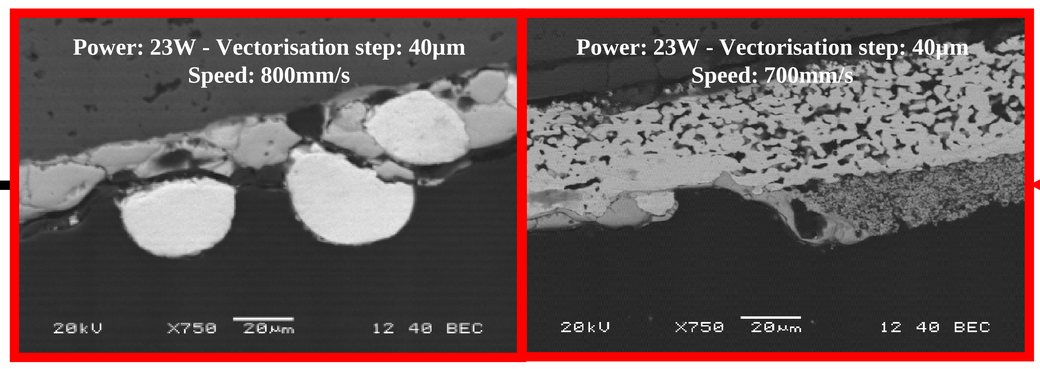
Nano composite ink: <u>0.7g of nanometer</u> size powder per ml of sol

Micro composite ink: <u>1.3g of micrometer</u> size powder per ml of sol



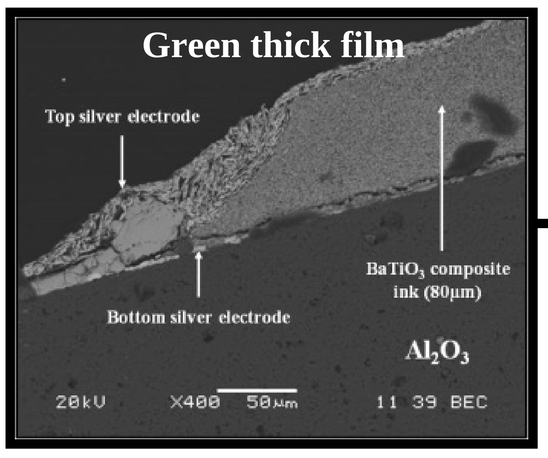
For both composite inks, a good densification ratio is obtained after the laser treatment
→ For electric measurements, a bottom silver electrode is deposited and sintered (750°C-5min) before the laser treatment



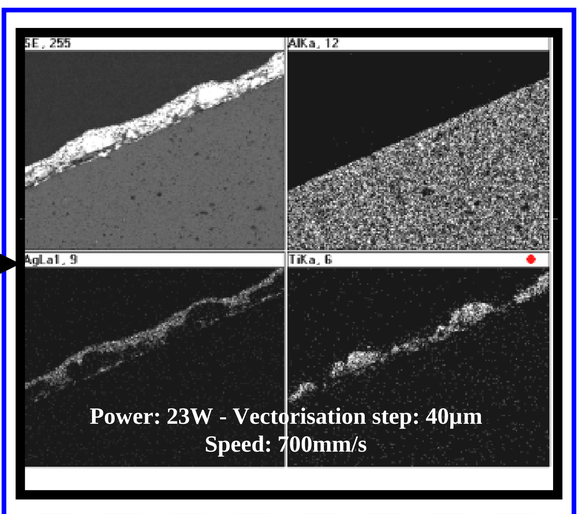


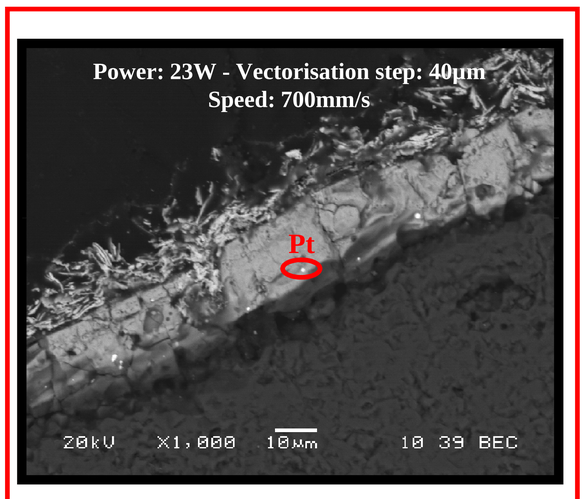
Problem : melting and diffusion of the bottom silver electrode
Solutions :
→ Increased the film thickness (screen printing)
→ Used an electrode with a higher melting point (Pt)

Screen printing

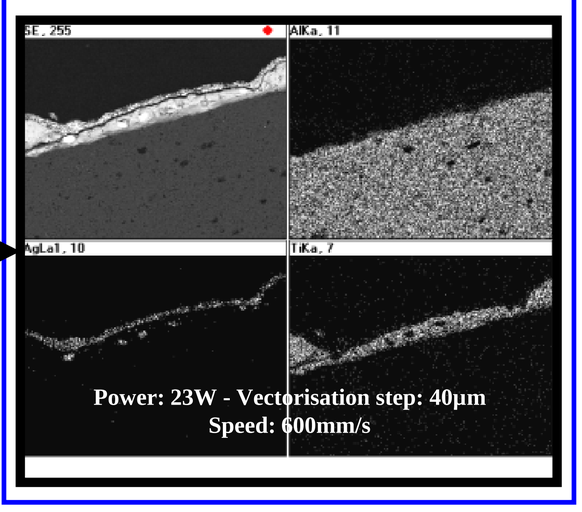


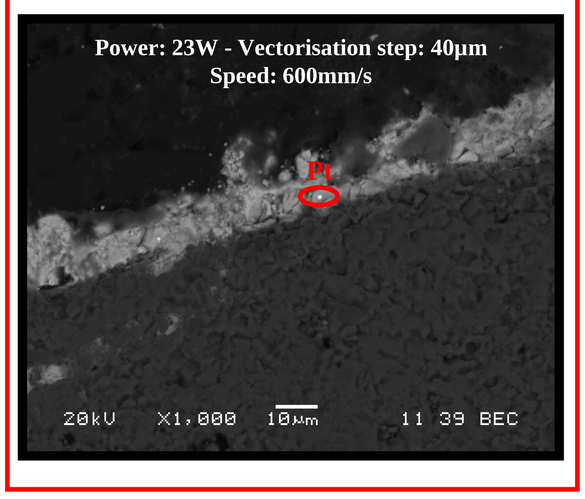
- Nano composite ink: <u>1.4g of nanometer</u> size powder per ml of sol





- Micro composite ink: <u>2.0g of micrometer</u> size powder per ml of sol





Two bottom electrodes have been used:

Silver

Platinum

Conclusion

Independently of the used deposit technique or the powder particle size distribution, a relatively good densification ratio of the films was obtained. Unfortunately, melting and diffusion of the bottom electrode after the laser treatment didn't permit any polarisation and thus any characterisation. The next step of this work will be to prevent the electrode diffusion by an adjustment of the selective laser sintering parameters and to obtain dielectric, ferroelectric and piezoelectric properties of $BaTiO_3$ thick films.

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