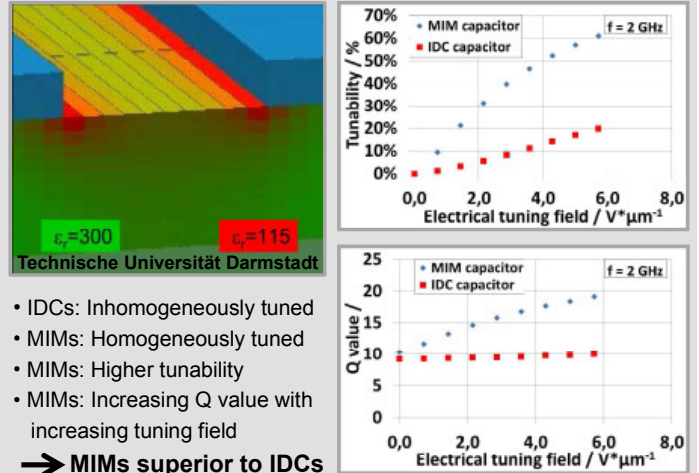


## Properties of MIM and IDC varactors

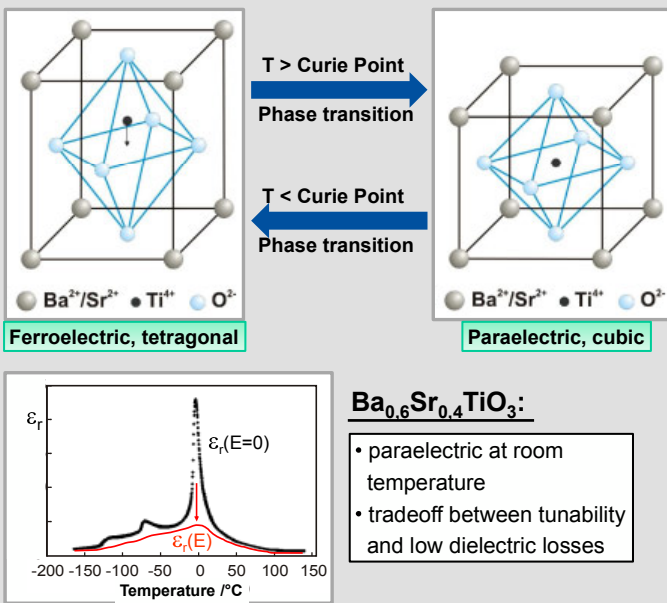


- IDCs: Inhomogeneously tuned
  - MIMs: Homogeneously tuned
  - MIMs: Higher tunability
  - MIMs: Increasing Q value with increasing tuning field
- ➔ **MIMs superior to IDCs**

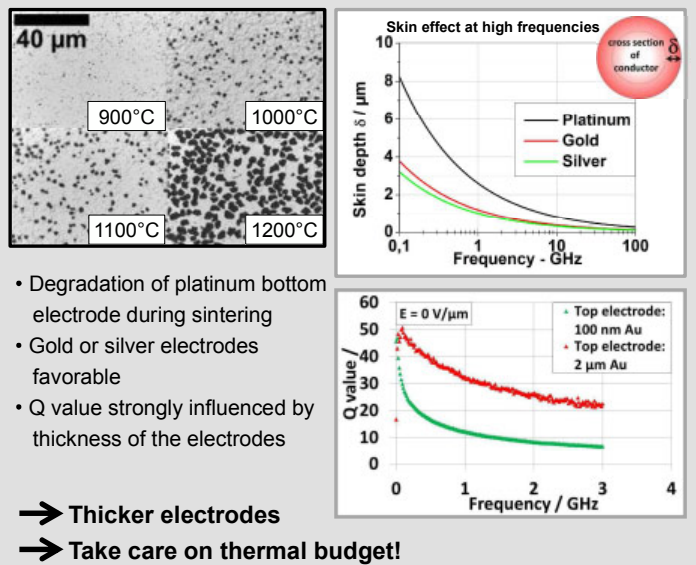
## Abstract

The ceramic solid solution Ba<sub>1-x</sub>Sr<sub>x</sub>TiO<sub>3</sub> (BST) is one of the most promising tunable dielectrics for the implementation of thick film based varactors. Electrically tunable varactors are in great demand for radio frequency (RF) applications, such as phase shifters or matching networks. Metal insulator metal (MIM) capacitors provide some advantages over coplanar interdigital capacitors (IDC), due to a homogeneous tuning field.

## Barium strontium titanate (Ba<sub>1-x</sub>Sr<sub>x</sub>TiO<sub>3</sub>)



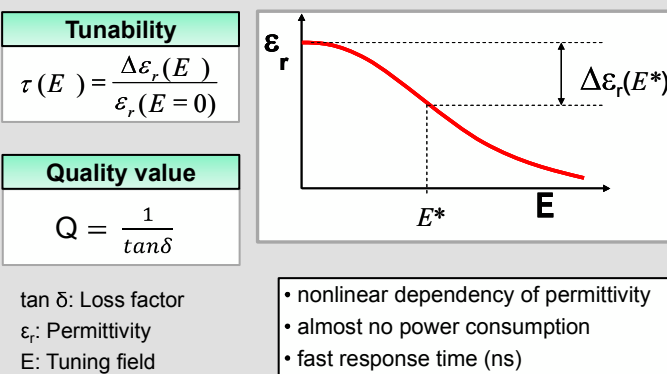
## Influence of electrodes on loss factor (tanδ)



- Degradation of platinum bottom electrode during sintering
- Gold or silver electrodes favorable
- Q value strongly influenced by thickness of the electrodes

➔ **Thicker electrodes**  
 ➔ **Take care on thermal budget!**

## Ba<sub>0.6</sub>Sr<sub>0.4</sub>TiO<sub>3</sub> as tunable dielectric



## Conclusion

- MIM varactors superior to coplanar IDC varactors due to homogeneous tuning field
- Strong impact of electrodes on dielectric properties (loss factor tanδ) of Ba<sub>0.6</sub>Sr<sub>0.4</sub>TiO<sub>3</sub> MIM varactors
- Galvanic reinforcement of the bottom electrode necessary for further increase of Q value
- Reduction of the sintering temperature below 1000°C necessary for the use of gold or silver bottom electrodes

## Acknowledgement

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