

ANTIFERROELECTRICS: MATERIALS FOR NEW CERAMIC POWER DEVICES

Klaus Reichmann, Theresa Kainz
Christian-Doppler-Laboratory for Advanced Ferroic Oxides
Stremayrgasse 9, 8010 Graz, Austria, k.reichmann@tugraz.at

ABSTRACT:

Recent developments in power electronics installed in hybrid vehicles or in converters for wind or solar power stations have triggered the search for buffer capacitors with increased charge density at high electric fields. The technical progress is again driven by miniaturization and energy efficiency. Components for new power electronic systems must therefore be able to handle higher current densities, higher power densities and higher operating temperatures. Especially high-voltage power capacitors have to meet new challenges. In modern power electronics the capacitors must fit with fast-switching semiconductors based on SiC and GaN that operate at high switching frequencies.

This lead to the revival of the anti-ferroelectric PLZT ceramics (lead-lanthanum-zirconate-titanate), which is able to fulfill above mentioned requirements. On the basis of this material a new ceramic capacitor technology called CeraLink™ has been developed for ripple suppression in high-voltage DC-links of inverters and converters. These components offer high current handling capabilities, a very low self-inductance and a high isolation resistance at compact size, high operating voltages and high temperatures.

This presentation highlights the technical advantages but also the issues of antiferroelectric PLZT components compared to the standard capacitor solutions and the improvements that have been achieved on the materials level.