

Modern ceramics help advance technology

Many important electronic devices used by people today would be impossible without the use of ceramics. A new study published in the *Journal of the American Ceramic Society* illustrates the use of ceramic materials in the development of technological devices, including mobile communication and ultrasonic imaging.

Researchers led by Paul Muralt of the Swiss Federal Institute of Technology reviewed the field of ceramic materials and explored the critical role that piezoelectric materials play in advancing technology.

Piezoelectric materials are functional ceramic materials that play a special role in telecommunication and ultrasonic imaging since they have the ability to efficiently transform electrical signals into mechanical vibrations, and vice versa. Piezoelectricity refers to the ability of some materials, notably crystals and ceramics, to generate electricity when compressed.

Over the last twenty years, micro-electro-mechanical systems (MEMS) have become a proven technology with many applications. Combined with piezoelectric films (piezo-MEMS) a number of important advantages are obtained. The intrinsic electro-mechanical quality of piezo-MEMS based on AlN thin films resulted in a breakthrough in cell phone technology, allowing for smaller phones, and a lowering of microwave radiation intensity.

Among piezoelectric thin film materials, PZT has recently shown much promise and will very likely be used for mass applications. Ultrahigh resolution ink-jet printing heads are expected to be the next break-through in piezo-MEMS. At different frequencies, it is possible that PZT MEMS could be used for motion sensors, vibration sensors, and optical mirrors, wristwatch rotary drives, and buzzers.

“There are many other applications under investigation, such as energy harvesting, oscillatory systems for clocks, mirror arrays, and scanners,” the authors conclude.

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