



## Sonderforschungsbereich 595 Elektrische Ermüdung in Funktionswerkstoffen



TECHNISCHE  
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*Sonderkolloquium  
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### **Nanoscale Engineering of New Ferroelectric Materials**

For the future human society, what can we do to prepare “dream materials” with high-performance, multi-function, environmental-friendly and rare-metal less? For the solution of this problem, I would like to propose two important factors, i.e., (1) ubiquitous elements, which are very usual and present everywhere, with large Clarke numbers, and (2) interface engineering with hetero-epitaxial interfaces. In general, ubiquitous elements have ordinary electron density distribution, and their compounds exhibit very normal property (of course, there are exceptions!!). So, we must consider how any properties can be enhanced even if the ubiquitous elements are used. To solve this, interface engineering is one possible way because heteroepitaxial interfaces can induce uniaxial and gradual stress-field near the boundary, and the stress-field can distort electron density distribution of the ubiquitous elements, and then, the distorted electron density distribution may contribute to enhance the properties and introduce new function. So, I believe that for the “dream materials”, nano-scale engineering must be required because of high density of heteroepitaxial interfaces. On the above concept, the following projects are under way in University of Yamanashi, i.e., (a) nanocube accumulation project, (b) high energy-density capacitor project with metal/ceramics interfaces, (c) high energy-density polymer capacitor project with structure gradient region of nanoparticles, (d) high-performance lead-free piezoelectric project by domain engineering, (e) high-performance lead-free piezoelectric project by artificial MPB engineering, and (f) high-performance lead-free piezoelectric project by complex nano-/macro-domain configuration. In the seminar, I would like to introduce briefly the above several projects and possibility of new development of “dream materials” by nano-scale engineering with a combination of the ubiquitous elements and high density of heteroepitaxial interfaces.

Der Vortrag findet um **13:30 Uhr** im Gebäude der Materialwissenschaften,  
Lichtwiese, Petersenstr. 23, **Raum 228** statt