

# Study of Size Effects in Nanopowders of Yttria Stabilized Zirconia Oxide

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## Abstract

### STUDY OF SIZE EFFECTS IN NANOPOWDERS OF YTTRIA STABILIZED ZIRCONIA OXIDE

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We presented investigations of yttria stabilized zirconia (YSZ) oxide powders with nanosize particles by electron spin resonance (ESR) method. To our knowledge this is the first study of YSZ nanomaterials by ESR. Two series of samples doped with 3% or 8% of yttria have been studied. The sizes of nanoparticles in both series of samples were 8 &#8211; 30 nm. The most intensive resonance lines with g-factors 4.25 and 1.97 were observed in all the samples. The characteristic feature of the line with  $g = 1.97$  was its complex asymmetrical form with broad shoulder to the side of smaller g-factor value. Computer analysis had shown that the line is composed from several lines. It was shown that each paramagnetic center's spectrum contains two lines: one from the bulk and another shifted to smaller g-factor side from interface region of nanosize grains. The integral intensity of the later line increases when the size of nanoparticle decreases. The theory of ESR line shape for nanomaterials is developed. The consideration was performed in the core and shell model which are respectively the nanoparticle regions unperturbed and perturbed by the surface influence. The calculations fit pretty good the observed size dependence of the line shape, intensity and width.