## Physico-chemical nanomaterials science

# Nanocrystaline powder in the $ZrO_2$–$Y_2O_3$–$CeO_2$–$Al_2O_3$ system with microaddictive of CoO

**V.V. Tsukrenko, O.K. Ruban, V.P. Red'ko, O.V. Dudnik**

*Frantsevich Institute for Problems inMaterials Science*
*Krzhizhanovsky str.3, 03680, Ukraine, Kyiv-142.*
*E-mail: tsukrenko@ipms.kiev.ua*

The zirconia based ceramics of complex composition combined of high strength, fracture toughness, chemical resistance, bioinertness and are perspective for orthopedic and dental restorative applications. The addition of $CeO_2$ and $Al_2O_3$ increases of resistance of Y-TZP ceramics to low temperature aging in the living organism environment. The microadditive of CoO provides colour contrast of ceramics.

The physicochemical properties of nanocrystalline powder with composition (mol.%): $93{,}7ZrO_2$–$2{,}8Y_2O_3$–$0{,}7CeO_2$–$0{,}3CoO$–$2{,}5Al_2O_3$ after heat treatment in the temperature range from 500 to 1200 °C were investigated by XRD phase and differential thermal analyses, scanning electron microscope and BET measurements.

The nanocrystalline powder with an average particle size 7 nm was produced by hydrothermal synthesis in an alkaline medium (pH > 9). At present work had been considered phase transformation of $ZrO_2$ and $Al_2O_3$ and chemical transformation of cobalt compounds during heat treatment.

The color of powder varied from white to bright blue when the powder was calcinated at temperature 1200 °C that suggested about the formation of $CoAl_2O_4$ spinel at 1200 °C. The investigated ceramic composite has good resistance to the aging in the humid environments and serves as a scientific basis for microstructural design of various bioinert implants.