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Nanocrystalline zirconia powder as basis for bioinert zirconia ceramics

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Bioinert zirconia ceramics are widely used for orthopedic joint replacements. The implant properties are determined by their microstructure, which primarily depends on the characteristics of the starting powders and their consolidation as well.

The aim of research was to determine the variations of the nanocrystalline powder properties in the ZrO_2-Y_2O_3-CeO_2 system with addition of Al_2O_3 and CoO versus the heat treatment in the temperature range from 400 to 1200 °C.

The powder matrix (mol.%) $95ZrO_2$-$3Y_2O_3$-$2CeO_2$ was produced by hydrothermal method. α-Al_2O_3 powder and cobalt nitrate $Co(NO_3)_2 \cdot 6H_2O$ was added by mechanically mixing to the matrix of zirconia to obtain nanocrystalline powder of compositions (wt.%) (90{ZrO_2-Y_2O_3-CeO_2}-$10Al_2O_3$)-$0{,}5Al_2O_3$-0,5CoO.

It was found that the addition of Al_2O_3 and CoO increased the specific surface area and preserved the nanocrystality of powders in the ZrO_2-Y_2O_3-CeO_2 system. It is defined that the activity of powders retained after addition of alumina and cobalt oxide.