SILICA GLASS AND NANOCOMPOSITES DOPED WITH Fe^{3+}- AND Co^{2+}-IONS PREPARED BY SOL-GEL PROCESS

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Iron and cobalt-containing silica glasses and nanostructures can be used as ferromagnetic materials and color filters [1,2]. Utilization of the sol-gel process for synthesis of silica glass is preferable because its low sintering temperature and high efficiency. Incorporation of fluorine into xerogel simultaneously with Fe- and Co-ions reduces bubble formation upon consideration by sintering and results in the formation of Fe- and Co-containing clusters in the network of silica gel-glass.

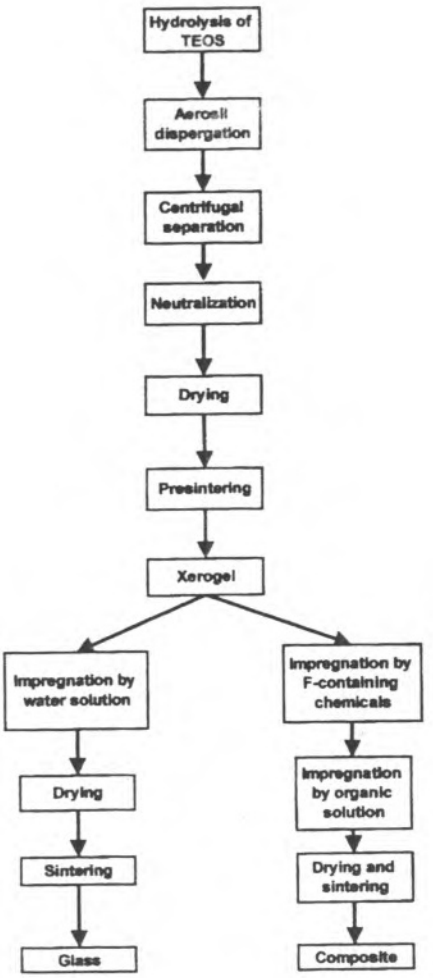
The Fe- and Co-doped glasses and composites were prepared by hybrid sol-gel process [3], modified in the part of doping technique. The flowchart of hybrid sol-gel process shows in figure.

The resulting gels were dried at 30-60°C in the period 7-14 days in air and presintered at 600°C in 2 hours. After thermo-treatment the xerogels were impregnated by water or organic solutions of $CoCl_2 \cdot 6H_2O$ or $FeCl_3 \cdot 6H_2O$.

The pore-size distribution in the gel structure measred by BET-Method has a complex character; the network contents micropores (3.0 nm), mezo- and macro-pores (5.0-25.0 nm). The pore size can be enlarged by chemical attack of silica network by fluorine ions in solution and also in vapor phase until heating and dissociation of Fe- and Co-containing compounds (HF, NH_4F).

The following thermo-treatment of Fe- and Co-containing xerogels in air at temperatures 600-1200°C lead to formation of silica glasses, containing 2000-2500 ppm of OH groups. The UV-Vis spectra and XDR-investigation shows both the presence of oxide- and fluoride-containing silica composites was equal to 100-200 p.m.

The models of $(Me_x)_n$ nanosized clusters in the structure of silica gel-matrices were proposed after studying of morphology and optical parameters.



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