

SOL-GEL SYNTHESIS OF Fe-CONTAINING SILICA SPHERICAL POWDERS

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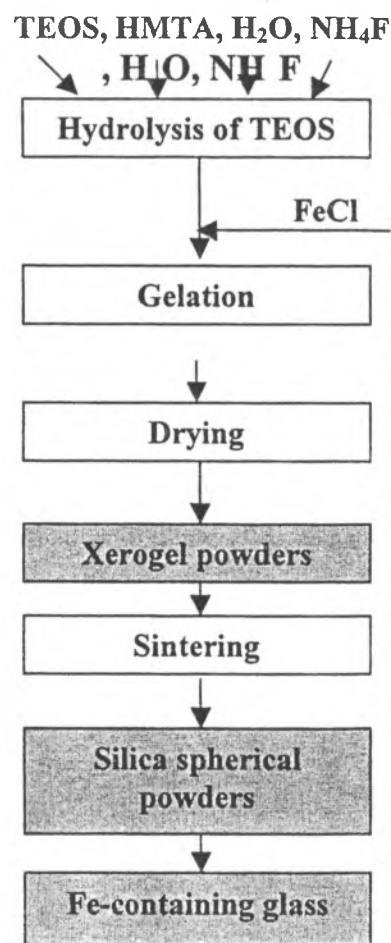
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Iron-containing silica glasses and nanocomposites can be used as ferromagnetic materials and color filters [1, 2]. Utilization of the sol-gel process for synthesis of silica glass is preferable because its low sintering temperature and high efficiency.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

The Fe-doped spherical powders for a formation of glasses and composites were prepared by sol-gel process, modified in the part of TEOS hydrolysis technique. The flowchart of novel sol-gel process shows in figure.

The process of monolithic silica spherical powders incorporates the hydrolysis of tetraethylorthosilicate in the system $\text{Si}(\text{C}_2\text{H}_5\text{O})_4 - \text{H}_2\text{O} - \text{NH}_4\text{F} - (\text{CH}_2)_6\text{N}_4$, addition of ferric sel into sol, gelation. After gelation the wet gel was dried slowly from room temperature up to 100°C in the period 1–2 days. The following thermo-treatment of Fe-containing xerogel in air at the temperature 600°C lead to formation of silica glass-like powders of spherical form. The following thermo-treatment of Fe-containing xerogels in air at the temperatures 1200°C lead to formation of silica glass-like powders containing ~200–250 ppm of OH^- groups.

REM investigation demonsttraite spherical formes of particles sized up to 1.0–1.5 mkm of diameter. The models of $(\text{MeF}_x)_n$ nanosized clusters in the structure of silica gel-matrixes were proposed after studying of morphology and optical parameters silica spherical powders. The cold izostatic pressing (CIP) procedure for preparation of Fe^{3+} -containing silica powders results in light-scattered materials of brown colour.



References

1. T.Akiyama, E.Tanigawa, T.Ida, *Chemistry Letters*, 1986, 723.
2. P.S.Shultz, *J. Am. Ceram. Soc.*, 1974, 57, 309.