

4th International Conference and Expo on

Ceramics and Composite Materials

May 14-15, 2018 | Rome, Italy

Aerogels – functional materials with promising optical applications

Dimitar Shandurkov, Nina Danchova and Denis Paskalev, and Stoyan Gutzov
Sofia University St. Kliment Ohridski, Bulgaria

Sol-gel technology is an advanced physico-chemical method for production of oxide ceramics, glasses, thin film coatings or aerogels. The starting chemicals /liquid precursors as tetraethoxysilane – TEOS/ allow homogenization at molecular level, production of rare chemical compositions and modification of their surface properties [1 - 5].

Aerogels are advanced solid sol-gel materials with extremely low thermal conductivity down to 0.01 W/m K; low density (below 0.1 g / cm³) and porosity at about 95%. There are two general strategies for preparation of aerogel particles depending on drying conditions, supercritical and subcritical drying [1, 2]. In the Department of Physical Chemistry, University of Sofia, a novel subcritical preparation scheme based on controlled drying at 0.2-0.5 atm and 40-70 °C was developed. The sol-gel scheme allows preparation both of aerogel microgranules and nanopowders. Recently, we also developed a new technique for incorporation of strongly red emitting complexes / Eu(III) phenanthroline nitrate / into silica aerogels leading to multicolour emitting powders [1, 2]. The technique was also applied to incorporate [Tb(phen)₂](NO₃)₃ and Eu(III) – DMF complexes into aerogel powders. Physicochemical properties of the powders obtained are shown below, SBET and Dav are surface area and mean pore diameter, respectively. Cabot Lumira™ aerogel granules (sample 5) are given for comparison.

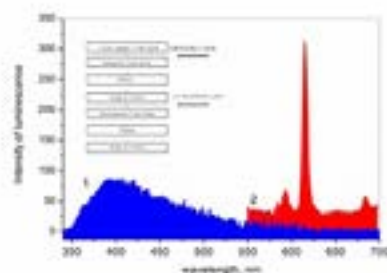


Figure 1. Luminescence spectra of functionalized aerogel powders: 1- blue emitting silica doped with 1,10 – phenanthroline, SiO₂:0.18phen; 2 – red emitting composites, SiO₂:0.007[Eu(phen)₂](NO₃)₃

Recent Publications:

1. S. Gutzov, N. Danchova, S. I. Karakashev, M. Khristov, J. Ivanova, J. Ulbikas, Preparation and thermal properties of chemically prepared nanoporous silica aerogels, *J Sol-Gel Sci Technol* 70 (2014) 511-516.
2. S. Gutzov, N. Danchova, R. Kirilova, V. Petrov, S. Yordanova, Preparation and luminescence of silica aerogel composites containing an europium (III) phenanthroline nitrate complex, *Journal of Luminescence* 183 (2017) 108–112.
3. J.C.G. Bunzli, On the design of highly luminescent lanthanide complexes, *Coordin Chem Rev* 293 (2015) 19-47.
4. Preparation and spectral properties of europium hydrogensquarate microcrystals, T. Kolev, N. Danchova, D, Shandurkov, S. Gutzov, submitted to *Spectrochimica Acta A* (2017)
5. N. Danchova, S. Gutzov, Functionalization of Sol-Gel Zirconia Composites with Europium Complexes, *Z Naturforsch B* 69(2) (2014) 224-230.

Notes: Biography

Dimitar Shandurkov studies Physical and theoretical chemistry at the Faculty of Chemistry and Pharmacy, Sofia University “St. Kliment Ohridski”. He possess experience in the sol-gel chemistry, hybrid optical materials, obtained at the Department of Physical Chemistry. In addition, he has a strong background in computational chemistry and applied mathematics.

dimitar.shandurkov@gmail.com