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## Scintillating aerogels from gels obtained by controlled destabilization of aqueous colloidal solutions : Toward radiometry.

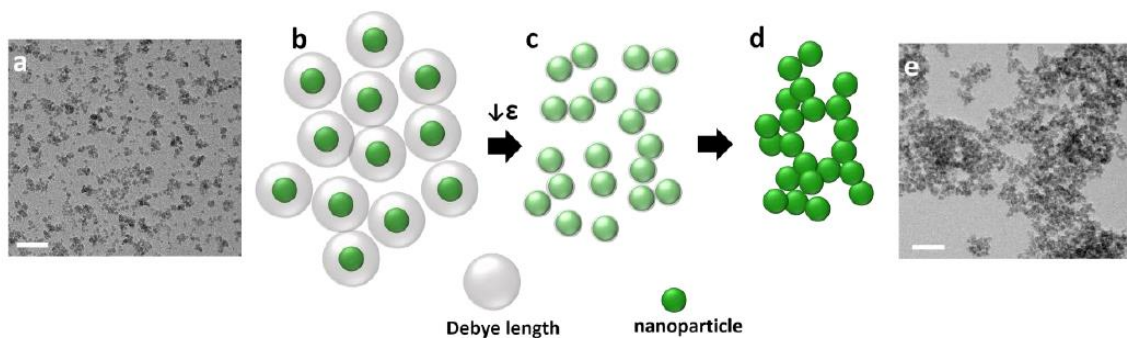
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### ABSTRACT:

The study presented here is focused on a general and versatile approach for the development of inorganic aerogels from aqueous colloidal solutions. In this approach, suspended crystallized nano-objects are used as building blocks allowing access to macroscopic porous structures that are highly crystalline and therefore functional. The starting point of this approach is the preparation of nanoparticles by solvothermal synthesis [1]. After purification, the nanoparticles are in the form of aqueous colloidal solutions, the dry extract of which can exceed 50% by mass. In these colloidal solutions the stability of the particles is ensured by the electrostatic repulsions which exist between the particles whose surface charge is extremely high (zeta potential  $\gg 40$  mV). A strong and abrupt change of the dielectric constant of the nanoparticle dispersion solvent induces formation of homogeneous and stable gels [2]. The drying of these gels, under supercritical conditions, leads to transparent functional aerogels. By this approach, YAG:Ce scintillating aerogels with good sensitivities under gaseous radionuclides presence were obtained.



**Figure 1:** a TEM picture of colloidal solution of YAG NPs; b-d sketch showing mechanism of particles flocculation and gelation; b stable NPs with large Debye length - strong repulsion between NPs; c the decrease of Debye length by reducing the dielectric constant of solution – diminished repulsion between NPs; d NPs aggregation due to the effective collisions - creation of flock spanning over whole volume of colloid; e TEM picture of aerogel

### References

[1] Odziomek, M.; Chaput, F.; Lerouge, F.; Sitarz, M.; Parola S. (2017) J. Mater. Chem. C, 5, 12561–12570.

[2] Odziomek, M.; Chaput, F.; Lerouge, F.; Dujardin, C.; Sitarz, M.; Karpati, S.; Parola, S. (2018) Chemistry of Materials. 30, 5460-5467.

