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Nanoparticle-based scintillating aerogels for real-time radioactive gas detection

Tuesday, 3rd September - 17:45: Nanoparticles synthesis, self-assembly - Oral

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The measurement of pure β emitting radioactive gases such as ^3H and ^{85}Kr is already of major importance for the nuclear safety authorities, and will meet an increasing demand with the expansion of nuclear-based energy production. Due to the short penetration length of β electrons in air, gaseous β emitters must be mixed with radiosensitive elements to enable detection. These are either gas-gas mixtures in an ionization chamber, or gas-liquid mixtures in liquid scintillation. However, none of these existing methods combine real-time analysis, sensitivity to multiple gases, and ease of deployment for on-site measurements.

We demonstrate a new gas-solid mixture approach using inorganic aerogels as nanoporous scintillators. This method combines the above criteria, allowing efficient real-time measurement of ^3H and ^{85}Kr activity. This presentation will focus on the preparation of scintillating aerogels, from the 10g-scale synthesis of scintillating nanoparticles to supercritical drying of nanoparticle gels into aerogels. This preparation method has been successfully applied to different scintillating nanomaterials.