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Semiconductor nanocrystals as detector of ionizing radiation in liquid scintillation counting

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The understanding of the health impact of low dose exposition to ionizing radiation is one of the scientific challenges of this century. To insure a proper assessment of the exposition to radioactivity, different methods of detection have been investigated. One of the most common detection methods is liquid scintillation counting, which convert the radiation energy into a light signal with the use of fluorophores.
In our study, semiconductors nanocrystals (NCs) were optimized to detect ionizing radiation through liquid scintillation counting.[1] Few experiments have been reported on the detection of actinides with NCs and they were performed exclusively with nanocomposite materials embedding NCs.[2,3] Because radionuclides standards are mostly available in acidic matrices and NCs are not stable in this condition, the elaboration of a scintillation cocktail was explored to validate the potential of NCs as scintillators. In a commercial scintillation cocktail, the addition of acidic water will quench part of the organic fluorophore but in the case of NCs there is a total dissolution of the fluorophore. Therefore, the acidic standard must be neutralized before it is added to the scintillation cocktail and the latter must be stable with the addition of this neutralized standard. This contribution highlights our recent progress concerning the optimization of the scintillation cocktail and the counting efficiency with different radionuclide and NCs.

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