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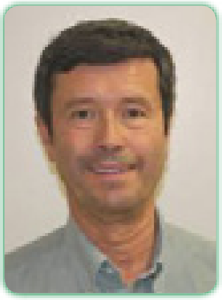
Gabor Patonay, Trends in Green chem 2017, 3:3
DOI: 10.21767/2471-9889-C1-004

3rd Annual Congress on
Pollution and Global Warming
&
4th International Conference on
Past and Present Research Systems of Green Chemistry
October 16-18, 2017 Atlanta, USA



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A green chemistry approach to fluorescence: Silica nanoparticles encapsulated dyes

Fluorescence spectroscopic applications often require the use of extrinsic fluorophores when intrinsic fluorescence of the molecule of interest is weak or in a spectral region that is prone to interference in the matrix. Introducing extrinsic fluorophores in the molecule of interest may require chemistry that utilizes reagent that is less environmentally friendly. Fluorescence intensity of a single molecular label can be relatively weak requiring larger amount of chemicals. All these concerns may be alleviated by encapsulating fluorophores *in silica* nanoparticles. Silica nanoparticles are biologically and environmentally friendly and can be designed for many applications. Covalently copolymerized dyes in silica nanoparticles are free from leaching. Even non-covalently encapsulated dyes are often virtually leached free. The outside of the silica nanoparticles can be designed for any labeling chemistry. The encapsulated dye can serve as a simple reporting label or as a sophisticated molecular probe. Due to the large number of dye molecules that can be encapsulated in a single silica nanoparticle the number of labels needed for detection is very small requiring minimal amount of chemicals. Silica nanoparticles synthesis is conducive for the introduction of covalently copolymerized fluorescent dyes by using modified TEOS reactive analogues that are widely available. The outside layer of the silica nanoparticle surface can serve as chemical reagent or sensor. For example we can change the hydrophobicity or pH sensitivity of the silica nanoparticle surface this way. This study reports how surface properties of fluorescence silica nanoparticles were modified by adding hydrophobic or hydrophilic molecules to achieve biocompatibility. Surface hydrophobicity controlled fluorescent silica nanoparticles are excellent for the detection of latent fingerprints. Surface modified silica nanoparticles can be utilized in capillary electro chromatography using amino acid-bonded silica nanoparticles as pseudostationary phases for chiral separations. Copolymerization of multiple dyes or other molecules will also be discussed.

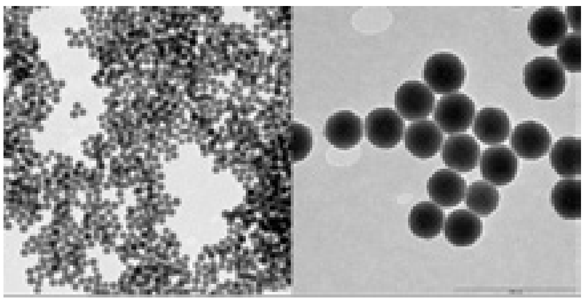

Figure 1: TEM of Silica nanoparticles used in these studies

Biography

Gabor Patonay is the Professor of Analytical Chemistry at Department of Chemistry, Georgia State University, Atlanta, GA 30303, USA. He obtained his MS and PhD degrees from the Technical University of Budapest, Hungary. In 1982, he left Hungary and joined Professor Isiah Warner's group at Emory University, Atlanta, GA USA. He joined the faculty of Georgia State University (GSU) in 1987, where he is currently Professor. He spent his years at GSU focusing on NIR fluorescence related research developing new bioanalytical and biomedical applications using NIR probes and labels. His recent research interests include bioanalytical and biological applications of fluorescent silica nanoparticles. He has published over 200 papers and is the Editor-in-Chief for Analytical Chemistry Insights

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