

Forging insight: unlocking the potential of silica spheres surface modification in sensing applications

Autorzy

Weronika Zając

Maciej Czajkowski

Joanna Cybińska

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The design of multifunctional colloidal photonic crystals (CPCs) with specific sensing properties allowing the detection of more than one analyte simultaneously remains a key challenge in advanced materials research. This paper presents a comprehensive approach to covalently surface-functionalized monodisperse silica spheres with selected dyes, resulting in materials capable of detecting target substances. A variety of surface modification pathways have been investigated, with a particular focus on the covalent attachment of organic dyes, including Methyl Red, Rhodamine B, and Calcein, to silica spheres using 3-aminopropyltriethoxysilane. The developed one-pot synthesis method offers a simplified procedure for the synthesis and purification of monodisperse spheres. Furthermore, this study presents, for the first time, photonic crystals comprising two types of spheres functionalized with two different dyes that are permanently bound to their surfaces and designed to detect two different analytes. This advancement demonstrates the potential for detecting two distinct analytes using a singular material, thereby expanding the scope of CPC-based detection technology.

Słowa kluczowe

Colloidal photonic crystal, OpalSensor properties, Surface modification, Dye, Silica spheres

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