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Optical sensing by integration of analyte-sensitive fluorophore to particles

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Highlights

- Conjugation of analyte-sensitive fluorophores to the surface of colloidal nanoparticles opens up new (bio)analytical applications.
- Interesting examples are described by using pH-sensitive fluorophores attached to colloidal particles, which allow investigating particle uptake by cells.
- Multiplexing approaches based on temporal discrimination are also possible when analyte-sensitive fluorophores are linked to the surface of intrinsically fluorescent particles.

Abstract

Analyte-sensitive fluorophores are a common tool in analytical chemistry. In case they are conjugated to the surface of colloidal nanoparticles new or improved applications are possible. An overview of the potential of such fluorophore-particle conjugates is given by means of several examples. First, using pH-sensitive fluorophores attached to particles are a helpful tool for investigating particle uptake by cells, as they can indicate whether particles are in the neutral slightly alkaline extracellular medium, or in acidic intracellular vesicles after endocytosis. Second, relating to lifetime-based methodologies, the fluorescence resonance energy transfer between fluorophores attached to quantum dots leads to longer lifetimes, improving their performance and expanding the possibilities of methods, such as lifetime imaging for *in vivo* applications. It also can be exploited for multiplexing approaches, in which the effective lifetime of the fluorophores can be tuned, allowing thus for the detection of several analytes based on temporal discrimination. Attention is focused to these three areas of application, because they are among the most reported in recent literature, and therefore of particular interest.

keywords: ion-sensitive fluorophores, pH sensing, colloidal nanoparticles, quantum dots, fluorescence resonance energy transfer, fluorescence read-out, particle uptake by cells, endocytosis