

## Dual pH-sensitive fluorophore ratiometric nanosensor with an extended dynamic range and tuneable $pK_a$

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Previously reported pH-sensitive nanosensors, consisting of commercially available fluorophores, are restricted to a defined  $pK_a$  and a limited pH range of measurement. By immobilising two pH-sensitive fluorophores and a reference fluorophore in a biocompatible matrix, we have produced a pH-sensitive nanoparticle with an extended measurement range and tuneable  $pK_a$ . Dual pH-sensitive fluorophore ratiometric nanosensors, with a diameter of approximately 40 nm, were prepared by entrapping combinations pH-sensitive fluorophores fluorescein isothiocyanate dextran (FITC-D) and Oregon Green® dextran (OG-D) and a reference fluorophore 5-(and-6)-carboxytetramethylrhodamine dextran (TAMRA-D) in an acrylamide matrix. Typically, pH-sensitive nanosensors containing a single pH-sensitive fluorophore have an effective dynamic range, of approximately 1.15 pH units. Whereas for nanosensors containing both FITC-D and OG-D, combined in a 1:1 ratio, the effective dynamic range is maximised, to 2.01 pH units. The  $pK_a$  of pH sensitive nanosensors can be tuned by varying the initial concentration of OG-D and FITC-D, during nanoparticle preparation. Through increases in the ratio of FITC-D to OG-D the  $pK_a$  of the nanosensor can be tuned, from 4.8 to 6.4. Extended dynamic range nanosensors will be able to make ratiometric measurements over the full physiological pH range, from pH 4.0 to 7.5, eliminating the need to perform multiple experiments with more than one type of pH-sensitive nanosensor. In addition, tuneable nanosensors can be engineered to specific  $pK_a$  so that sensitivity in a narrow pH range can be maximised.

### Biography

Veeran Chauhan completed his master's degree from the University of Manchester and is currently studying towards a PhD, in biosensing with nanosensors, at the University Of Nottingham School of Pharmacy. He is a practicing community pharmacist, having had roles previously in industry and hospital settings.

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