Record 1 of 1
Title: Electrostatic charge interaction: a case study on tapered PMMA fiber for calcium nitrate detection

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Abstract: Purpose - This paper aims to propose and demonstrate a simple fiber optic sensor using a tapered plastic multimode fiber as a probe for measurement of calcium nitrate concentrations in de-ionized water.

Design/methodology/approach - The working mechanism is based on the observed increment in the transmission of the sensor that is immersed in calcium nitrate solution of higher concentration. The tapering of the plastic fiber is carried out by etching method using acetone, sand paper and de-ionized water.

Findings - Tapered fiber with diameter 0.45 mm gives the highest sensitivity of 0.028 mV/% due to better interaction between the evanescent field and the calcium nitrate solution with a good slope linearity of more than 98 per cent for a 1.07 per cent limit of detection in a straight probe arrangement. The use of calcium and nitrate ions within the sensing medium demonstrates the strong dependency of the sensor output trend on the electrolytic nature of the chemical solutions.

Originality/value - Demonstration of tapered plastic multimode fiber sensor probe for measurement electrolytic chemical solutions.

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