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Optical probe for the analysis of trace indole in shrimp

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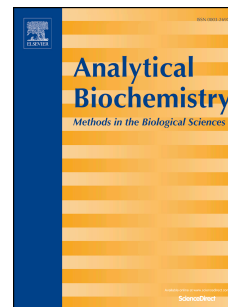
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1 Optical probe for the analysis of trace indole in shrimp

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4
5 **Abstract.** Indole is a chemical from the decomposition of shrimp and is used extensively to
6 indicate seafood freshness. US Food and Drug Administration (FDA) sets its concentration of
7 <25 $\mu\text{g}/100\text{ g}$ shrimp as the threshold for Class I (fresh shrimp). A novel optical probe is
8 reported to quantitatively analyze trace indole in shrimp, including the Class I threshold
9 concentration. Based on an Ehrlich-type reaction, visible spectroscopic analysis of indole in
10 petroleum ether gives a limit of detection (LoD) and quantification (LoQ) of 0.05 and 0.16
11 $\mu\text{g mL}^{-1}$, respectively. For 25 μg indole /100 g shrimp extracted into petroleum ether, the probe
12 successfully detects it and the color change is visible to the naked eye. Analysis of the probe
13 response by a visible spectrometer leads to quantification of $\leq 25\ \mu\text{g}$ indole /100 g shrimp, when
14 recovery is accounted for. When a handheld colorimeter, based on the CIELAB color space,
15 and a smartphone with Bluetooth connectivity are used, the probe demonstrates similar
16 sensitivity for indole in shrimp. The current probe is made of 4-(dimethylamino)benzaldehyde
17 (DMAB) and catalyst p-toluenesulfonic acid (PTSA) in thin films. Indole in shrimp samples after
18 extraction reacts with DMAB to give red β -bis(indolyl)methane.

19
20 **Keywords:** Indole, shrimp, optical probe, CIELAB color space, 4-(dimethylamino)benzaldehyde,
21 portable colorimeter

22 **Highlights:**

- 23 • Sensitive optical probe to test shrimp freshness
- 24 • Naked-eye, qualitative color change for Class I (fresh) shrimp

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