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Purple silicones: design of a versatile sensor for screening of antioxidant activity

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Solid-state colorimetric sensors represent a competitive technology over traditional solution-based analytical assays: they are facile, rapid, cost-effective, and they allow for the naked-eye and *in situ* detection of the results. In particular, a lot of attention is drawn to the development of smart assays for the evaluation of antioxidant activity of compounds, food samples, or natural extracts, due to the importance of antioxidants in counteracting oxidative damage in the human organism. Among the traditional *in vitro* antioxidant activity assays, the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical assay is one of the most extensively employed.[1] The DPPH test is based on a redox reaction associated with a colorimetric process: when an antioxidant reduces the radical, a change in color from purple to yellow occurs. Some examples of solid-state DPPH test were found in literature; in these cases, the DPPH reagent was not immobilized but only deposited on a solid surface,[2] or the fabrication process of the sensor requires long time.[3] Silicone elastomers are widely used as a matrix for entrapping indicator dyes to produce colorimetric sensors, since they are versatile, easily processable, optically transparent, and flexible. Here, we report the use of DPPH radicals that are physically immobilized as a uniform dispersion into a silicone matrix. The silicone colorimetric sensor can be fabricated in a rapid and facile manner and the resulting elastomer can be used as a solid-state and ready-to-use sensor for direct colorimetric detection of antioxidants. The response of the sensor is investigated qualitatively and quantitatively towards selected antioxidants of different nature and solubilized in different media, in order to determine their antioxidant activity.

[1] Blois, S. M. Antioxidant determinations by the use of a stable free radical. *Nature* **181**, 1199–1200 (1958).

[2] Hidayat, M. A., Fitri, A. & Kuswandi, B. Scanometry as microplate reader for high throughput method based on DPPH dry reagent for antioxidant assay. *Acta Pharm. Sin. B* **7**, 395–400 (2017).

[3] Steinberg, I. M. & Milardović, S. Chromogenic radical based optical sensor membrane for screening of antioxidant activity. *Talanta* **71**, 1782–1787 (2007).