**Silk-nanodiamond-curcumin wound dressings for sensing infection**

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Infection in a wound or surgical incision site is typically diagnosed based on the external appearance of the area, such as redness, swelling, odour, and/or loss of function. However, this requires the removal of any dressing that might be present, which can cause pain and discomfort to the patient. This could also lead to inaccurate and untimely diagnoses, since an infection might be present without obvious symptoms. Hence, there is a need for more precise methods of detecting infections, with minimal effects to the patient. Comparison of temperature differences between healthy and infected tissue shows an increase of 3-4 °C in infected tissue, while normal skin has a temperature gradient of ±1 °C (Chanmugam *et al*. 2017). Hence, monitoring the temperature of a wound site can be used as a tool for detecting the presence of an infection.

Here we investigate the use of nanodiamonds (NDs) containing negatively charged nitrogen-vacancy (NV-) centres for tracking these changes in temperature. The optically detected magnetic resonance (ODMR) of the NV- centre provides a possible index of temperature variation, since the ODMR frequency shifts predictably with increase in temperature (Fig. 1) (Khalid *et al*. 2019). Hence these NDs show preliminary proof-of-principal for tracking thermal variations at a wound site, with minimal influence by environmental factors such as pH, ion concentration or molecular interaction. Silk fibres are used as the wound dressing matrix to encapsulate these NDs and to further enhance the wound healing and anti-bacterial properties, the silk fibres are incorporated with curcumin (Akbik *et al*. 2014). This will result in a wound dressing that is capable of sensing and monitoring temperature changes at a wound site, without the need for frequent removal of the wound dressing.

**Fig. 1. Optically detected magnetic resonance spectra of fluorescent nanodiamonds containing negatively charged nitrogen-vacancy (NV-) centres at different temperatures (Khalid *et aI.* 2019).**

**References**

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