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Advanced wound dressing for real-time pH monitoring

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The increasing demand of wearable technologies is giving rise to a strong push for the design of textile chemical sensors targeting the real-time monitoring of vital parameters for improved healthcare. Among the most challenging applications, monitoring of nonhealing wounds is a scarcely explored medical field that still lacks quantitative and minimally invasive tools for the management of the healing process. This contribution deals with the development of a smart bandage for the real-time monitoring of wound pH, which correlates with the healing stages and gives direct access to the wound status without disturbing the wound bed. The fully textile device is realized on medical bandages and relies on a newly-designed electrochemical pH sensor based on biocompatible materials and operating at low applied voltage (0.2 V). The sensing layer, including a screen-printed sensor made of semiconducting polymer and iridium oxide particles, was combined with a medical grade foam ensuring the delivery of a continuous wound exudate flow across the sensor area. The pH sensor exhibits a reversible response with a sensitivity of (59 ± 4) μA pH−1 in the medically relevant pH range for wound monitoring (pH 6–9) and its performance was assessed and validated in terms of accuracy, selectivity against the most common chemical interferents and stability to temperature variations (from 22 to 40°C). Thanks to the robust sensing mechanism and the simple device geometry, the fully assembled smart bandage was successfully validated in flow analysis using synthetic wound exudate. Following this approach, the design of wound moisture and uric acid sensing dressings is currently under development.

Recent publications

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