Humidity and Temperature embedded textile sensor based on Graphene

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Textile electronics allows the integration of electronic devices in everyday life textile objects. However, sensing materials must be lightweight, imperceptible, low energy consumption and be flexible without compromising the textile characteristics. Therefore, it is required advances in materials and manufacturing processes combining flexibility, electrical properties of semiconductors and metals with solution and low temperature processing [1]. To achieve wearable electronics full potential, Graphene, a 2D material, with its flexibility, transparency, and high electrical conductivity [2], is suitable for textile electronics, as we recently demonstrated by developing a textile coated with graphene with sheet resistance lower than 1 kΩ sq^{-1}, while maintaining the textile mechanical properties [3, 4].
Wearable temperature and humidity sensors are versatile sensors as these can be used for body and environment monitoring to detect pathologies, or athlete's capabilities during their sport activity. Existing wearable systems lack flexibility, are discomfortable, do not withstand washing and bending cycles.
Taking advantage of Few-Layer Graphene (FLG) properties and solution processability, we developed a humidity and temperature dual resistive sensor embedded in a textile capable of overcome bending and washing cycles, preserving their physical and mechanical properties. Our flexible sensor presents humidity sensitivity values of $-2.32\cdot10^{2}$ $\%^{-1}$ and $-1.52\cdot10^{-1}$ $^{o}C^{-1}$ for temperature, 4 and 1 times higher than similar sensors (fig. 1) [5], demonstrating their potential for environmental and biological monitoring.

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FIGURES

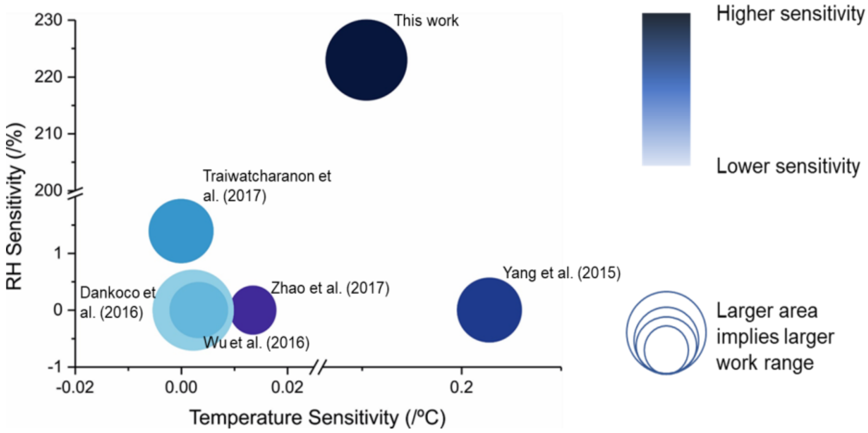

Figure 1: Comparison of our sensor with other similar flexible temperature and relative humidity sensors sensitivities.

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