Supplementary Information (SI) for Sensors & Diagnostics.
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Supplementary Data

Graphene Nanoplatelets-Nickel Ferrites Coated Textile-based Embroidered Capacitive Pressure Sensor for Wearable Electronics Application

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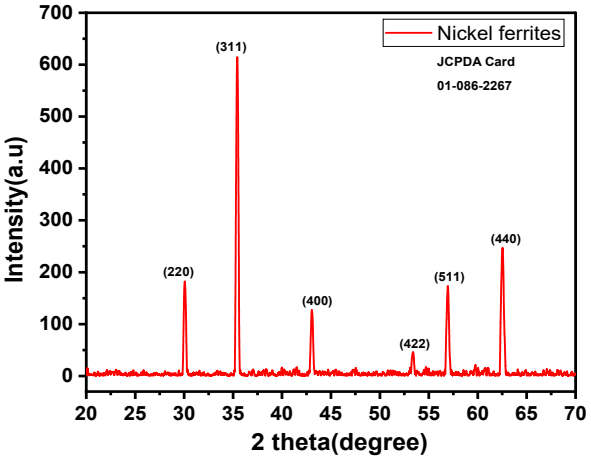
XRD Analysis:



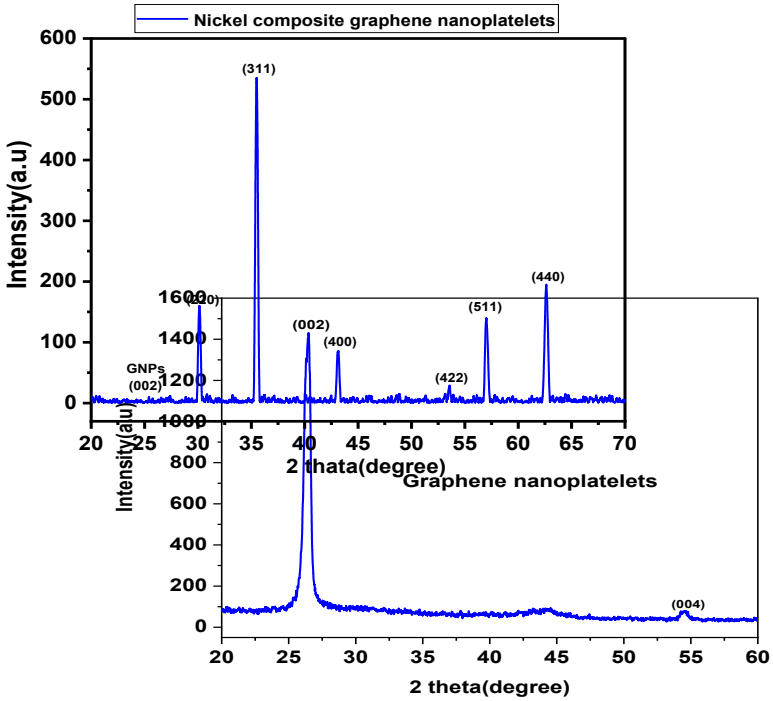


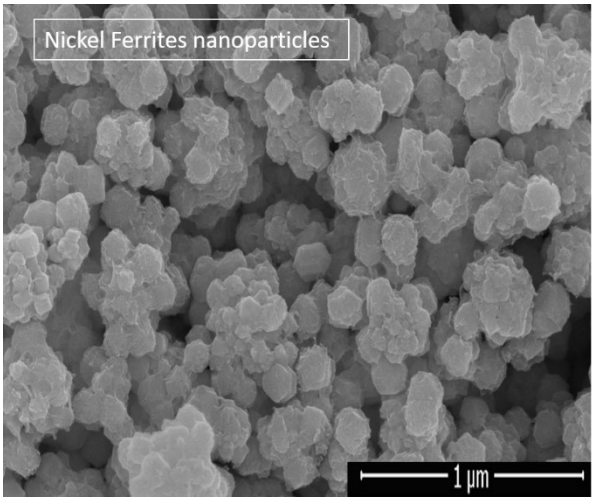
Fig. S1: X-ray diffraction pattern of as-synthesized nickel ferrites nanoparticles, composite, and bare graphene Nano platelets.

The expert high score software was utilized to perform Rietveld refinement of the XRD data in order to conduct a full structural analysis. The refined X-ray pattern of synthesized ferrites is perfectly matched with the standard JCPD card 01-086-2267. Reflections (220), (311), (222), (400), (422), (511), (440) occurred which are allowed reflection of cubic spinel structure. These reflections are strong and exhibit a small broadening, which could be because the produced nickel ferrite is nanocrystalline. Every reflection found in the XRD pattern is a part of the cubic spinel structure of the fcc type. Moreover, the crystallize size and d-spacing and dislocation density of bare nickel ferrite was also calculated and documented in Table S1. Our results revealed that nanopowder has a crystalline phase purity. The presence of reflections specific to the cubic spinel structure was identified through a thorough inspection of the XRD pattern. The XRD pattern showed no additional peak. By utilizing the Debye-Scherrer formula, the crystallite size was calculated to be 110 nm.

Table S1: Crystallize size and d-spacing and dislocation density of bare nickel ferrite

		Nickel ferrites pure				
No.	Pos. [°2Th.]	FWHM Left [°2Th.]	d-spacing [Å]	Crystallite size nm	Lattice constant A	Volume of unit cell A3
1	30.06933	0.0984	2.97196	87.24497	8.39246	591.10952
2	35.40502	0.07872	2.53535	110.5595	8.39532	591.7148
3	43.02411	0.05904	2.10238	150.95033	8.39609	591.87601
4	53.37877	0.23616	1.71642	39.29692	8.39537	591.72365
5	56.90021	0.07872	1.61828	119.79943	8.39551	591.75301
6	62.46649	0.072	1.48556	134.68628	8.39731	592.13562

SEM Analysis:



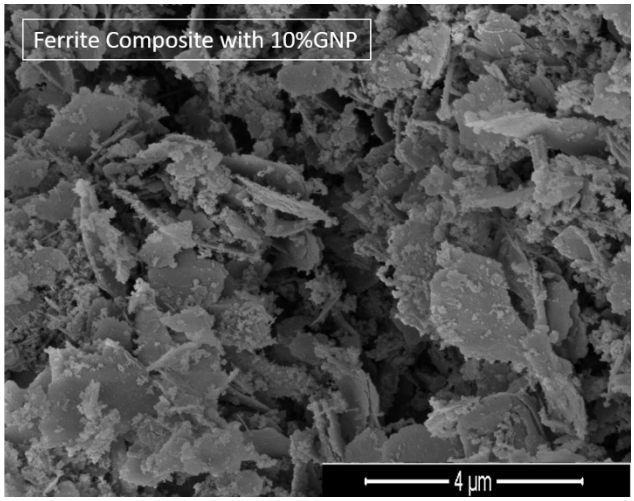


Fig. S2: The morphology of nickel nanoparticles and their composite with GNP Nano platelets.

Fig. S2 displays an image of the SEM of pure nickel ferrite nanoparticles synthesized using the wet chemical co-precipitation process and various nickel concentrations. The nickel ferrite nanoparticles have a consistent morphological look and minimal aggregation, with sizes ranging from 150 to 200 nm by scaling process. On the other hand, GNP/ferrite nanocomposite shows that nanoparticles are uniformly distributed on GNP nano platelets with some stacking.

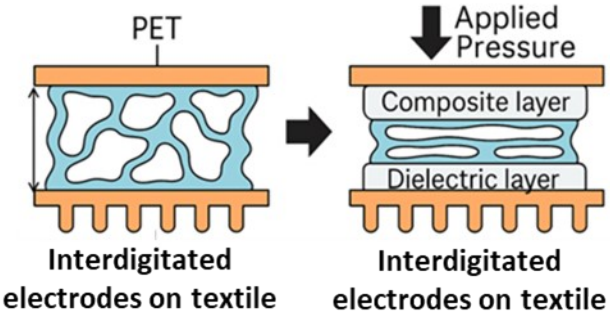


Fig. S3: Capacitive pressure sensor (a) without pressure (b) after applied pressure

We have tested the sensor performance at different times of the day, and Graph S4 is presented in the supplementary file. In this study, the capacitive sensor was not in direct contact with the skin, as it was sealed with PET. Consequently, human skin moisture has a negligible effect on sensor performance, similar to environmental conditions.

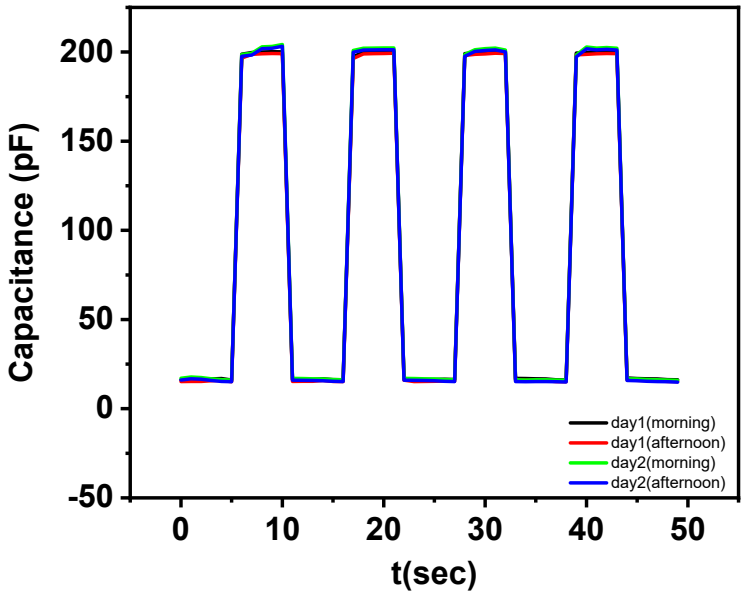


Fig. S4: Capacitive pressure sensor stability test