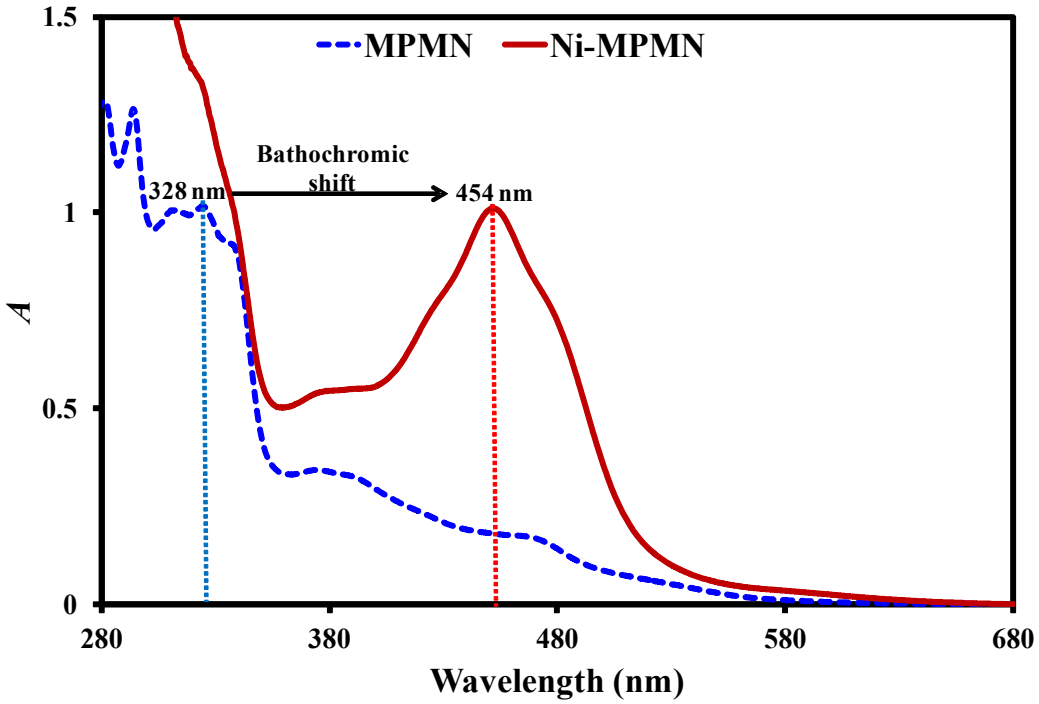
Supplementary Information (SI)

SI-1: UV-vis study

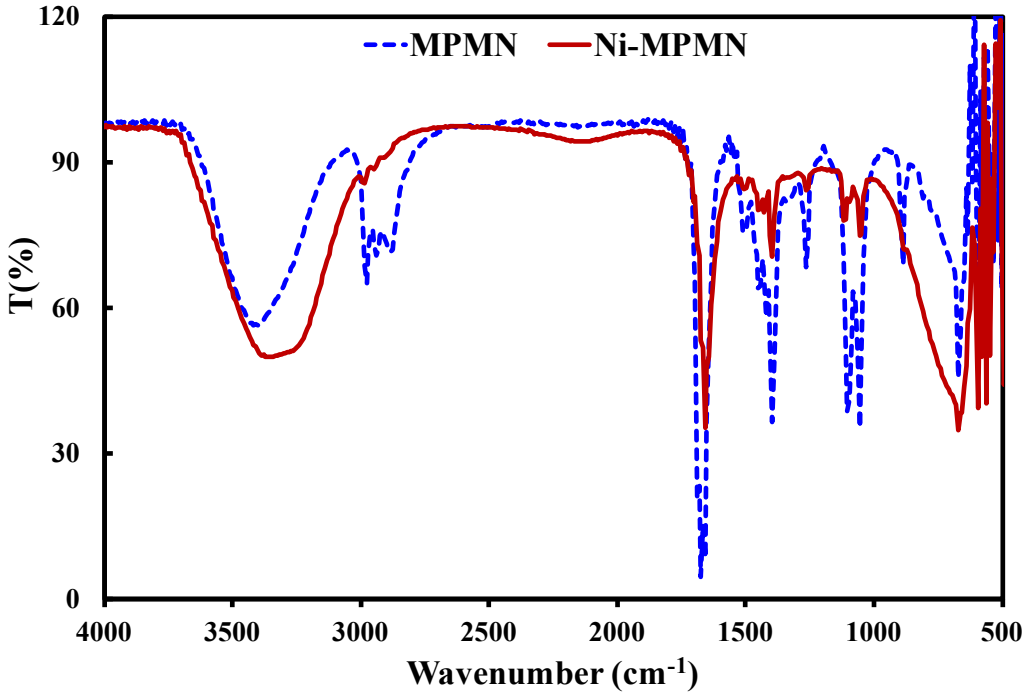
The analytical utility of styrofoam modified paper for sensitive detection of Ni^{2+} was tested by one –step assay. Preliminary investigation has revealed that, on mixing the test aqueous solution of Ni^{2+} (1.0 µg mL^{-1}) with MPMN, a red colored complex was developed. In the visible region, the electronic spectrum of the reagent showed two ill-defined peaks at 380 and 460 nm and were safely assigned to n → π*transition electronic transition.[1] On the other hand, the spectrum of the developed red colored complex of Ni^{2+} with MPMN showed two well-defined peaks at λ_{max}380 and 460 nm and are safely assigned to $^1A_{1g} \rightarrow {}^1B_{1g}$, and $^1A_{1g} \rightarrow {}^1A_{2g}$ (P) d-d electronic transition in square planar geometry.[1]



SI-1: Absorption UV-visible spectra of the reagent MPMN (Blue dotted line) and its Ni^{2+} complex (Red solid line).

SI-2: IR study

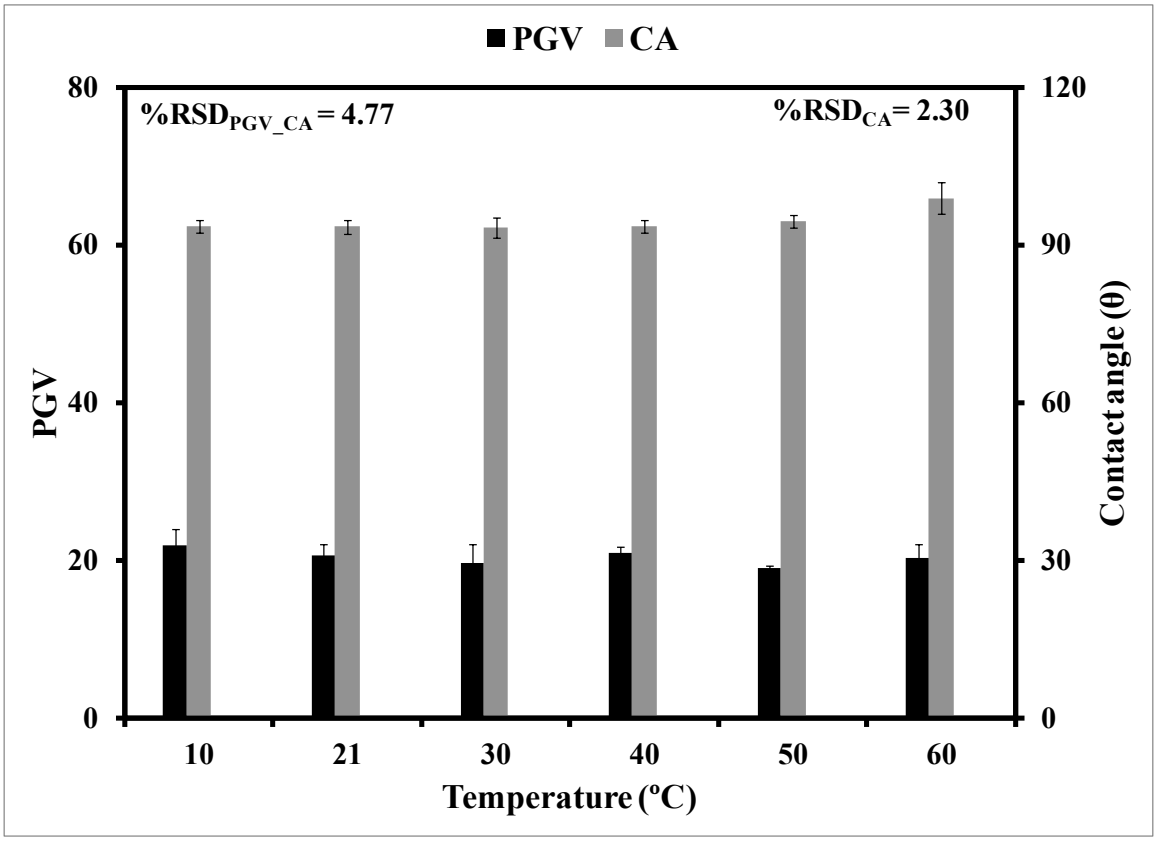
The reagent MPMN has numerous coordination sites (-SH, -N=N- and –OH) in complex formation with nickel. The most probable binding sites of the free MPMN in its Ni^{2+} complex were safely assigned by comparison of their FTIR spectra (4000–400 cm^{-1}) in the solid state (SI, 2). In the spectra of the free MPMN and its Ni complex, the broad vibration modes at 3450 and 3400 cm^{-1} are assigned to phenolic ν(OH) group.[2] The participation of the deprotonated mercapto group (-SH) group upon chelation with Ni^{2+} was confirmed by the disappearance of the vibration at 2800-2850 cm^{-1} with appearance of new band at 405 cm^{-1} due to ν(Ni–S).[2] The observed vibration at 1650 cm^{-1} in the free ligand was shifted to lower wave number at 1600 cm^{-1} upon complex formation revealing participation of the reagent through azomethine group. Thus, it can be concluded that; the reagent MPMN coordinated to Ni^{2+} via mercapto SH group after deprotonation and azomethine nitrogen forming a six-membered ring chelate in 1:2 Ni:MPMN molar ratio (i.e. $Ni(MPMN)_2$) (Figure 1-B).



SI-2: FTIR spectra of the reagent MPMN (Blue dotted line) and its Ni^{2+} complex (Red solid line).

SI-3: Influence of surrounding temperature on modified substrate and developed method

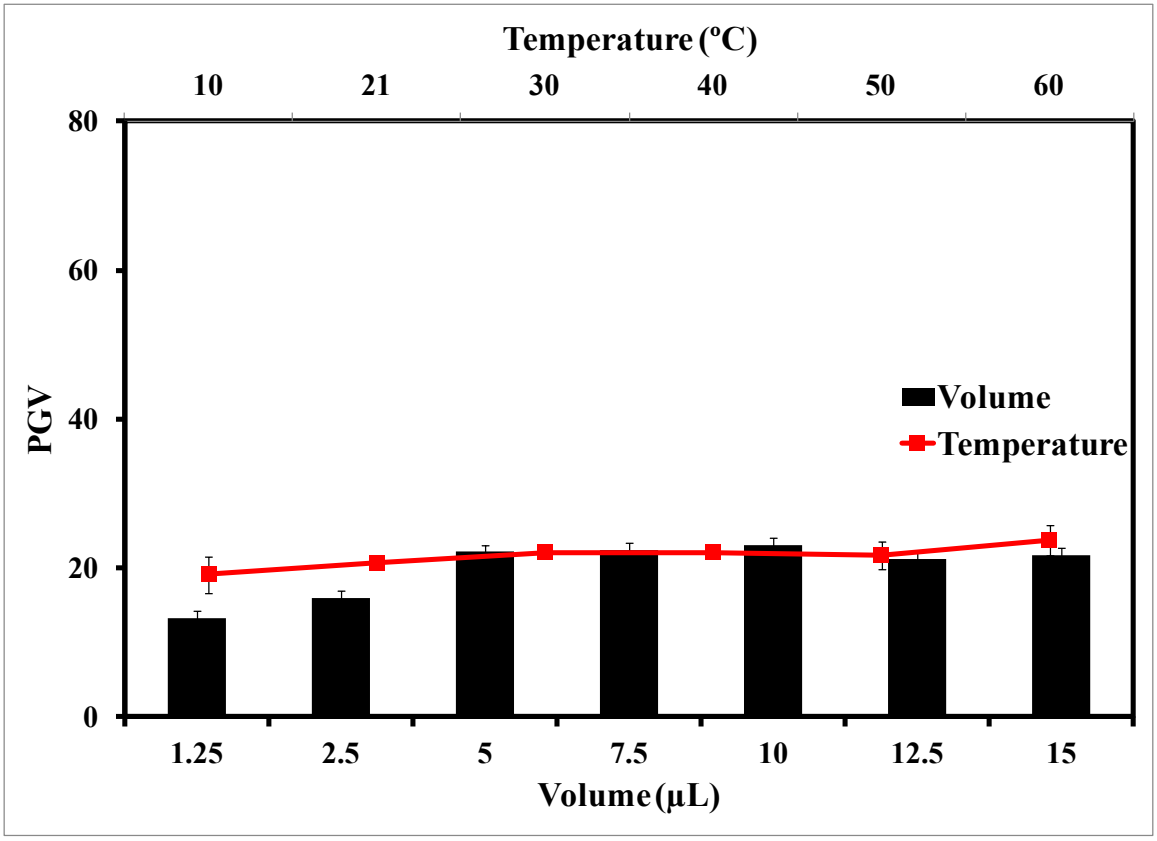
The effect of surrounding temperature on wettability of modified paper was also tested. Freshly polystyrene modified paper was incubated at various temperatures (10, 30, 40, 50 and 60 ºC) for 1 h and the influence on contact angle (θ) as well as on the Ni^{2+} assay was investigated. (For room temperature incubation i.e., ~21 ºC, no additional arrangement was required). Goniometer studies revealed that the environmental temperature did not affect the surface wettability, as the change in water contact angle of modified paper treated at various temperatures showed %RSD value of 2.30 (see Figure SI-3). Such minimal change on the substrate hydrophobicity would cause no change on the performance of Ni^{2+} assay. To confirm our point, a one-step assay for Ni was executed on above treated surfaces using 1.0 µg mL^{-1} Ni solution. Assay results presented below clearly show that the Ni^{2+} assay performance on modified platforms subjected to various temperatures were similar with %RSD was less than 5%.



SI-3: Data plot showing the influence of temperature on the water contact angle (θ) and its effect on the signal intensity for Ni determination.

SI-4: Influence of solution temperature and volume on the developed method.

Another important parameter under investigation was to understand the influence of analyte solution temperature as well as assay volume on our developed method. For the former study, Ni^{2+} solution (1.0 µg mL^{-1}) was incubated at various temperatures (10, 30, 40, 50 and 60 ºC) on a thermostat controlled water bath for 1 h and assay was performed as described in section 2.4.1 (For room temperature incubation i.e., ~21 ºC, no additional arrangement was required). As shown in Figure SI-4, it was observed that the solution temperature did not affect the assay performance and our developed method can work efficiently at a gradient of solution temperatures ranging from 10 ºC to 60 ºC.



SI-4: Data plot showing the influence of analyte solution temperature and analyte volume on the signal intensity for Ni determination.

And lastly the influence of assay volume deposited on MPMN spots was also investigated. Similar concentration (1.0 μg mL^{-1}) of Ni was used in this study whereas the deposited volume was varied from 1.25 μL to 15 μL. Assay results show that at low analyte volume (<2.5 μL) the PGV values was less than that observed for the optimum volume used in this study (i.e., 7 μL). However, from 5 μL onwards up to 15 μL the obtained PGV values were similar, thus confirming the robustness of our developed method in terms of volume as well (Figure 6).

References:

1. A.B.P. Lever, *Comprehensive Coordination Chemistry II: From Biology to Nanotechnology***,** Elsevier, 2004.

2. K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, Wiley Interscience, New York,1971.