SUPPLEMENTARY MATERIAL

Nitrogen-doped hollow carbon spheres as chemical vapour sensors

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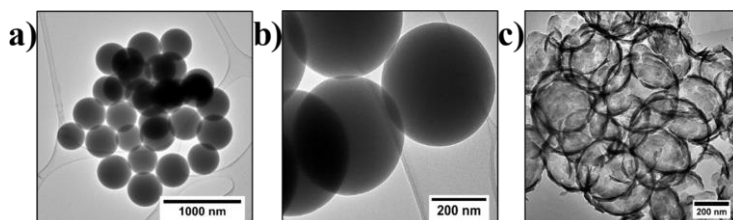
[e] Deceased

Figure S1: TEM images of; (a-b) SiO_2 spheres and (b) N-HCSs-50.

Figure S2b inset shows the pore size distribution calculated by the Barett-Joyner-Halenda (BJH) method with a broad peaks observed between 20 and 100 nm for all the HCSs; characteristic of the presence of pores and voids in the mesoporous and macroporous region[1]. In the N-HCSs-50, a sharp peak was observed at 100 nm indicating the creation of macropores probably resulting from void of the broken HCSs.
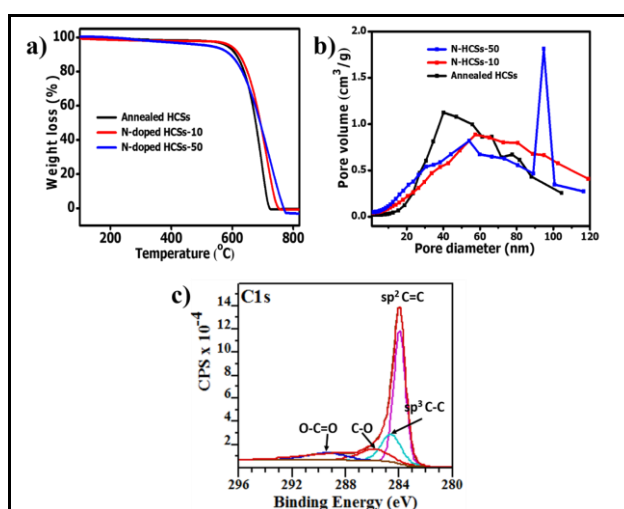

Figure S2: Thermal gravimetric curves, (b) pore size distribution plots of annealed HCSs and N-HCSs and (c) C 1s spectra of annealed HCSs.
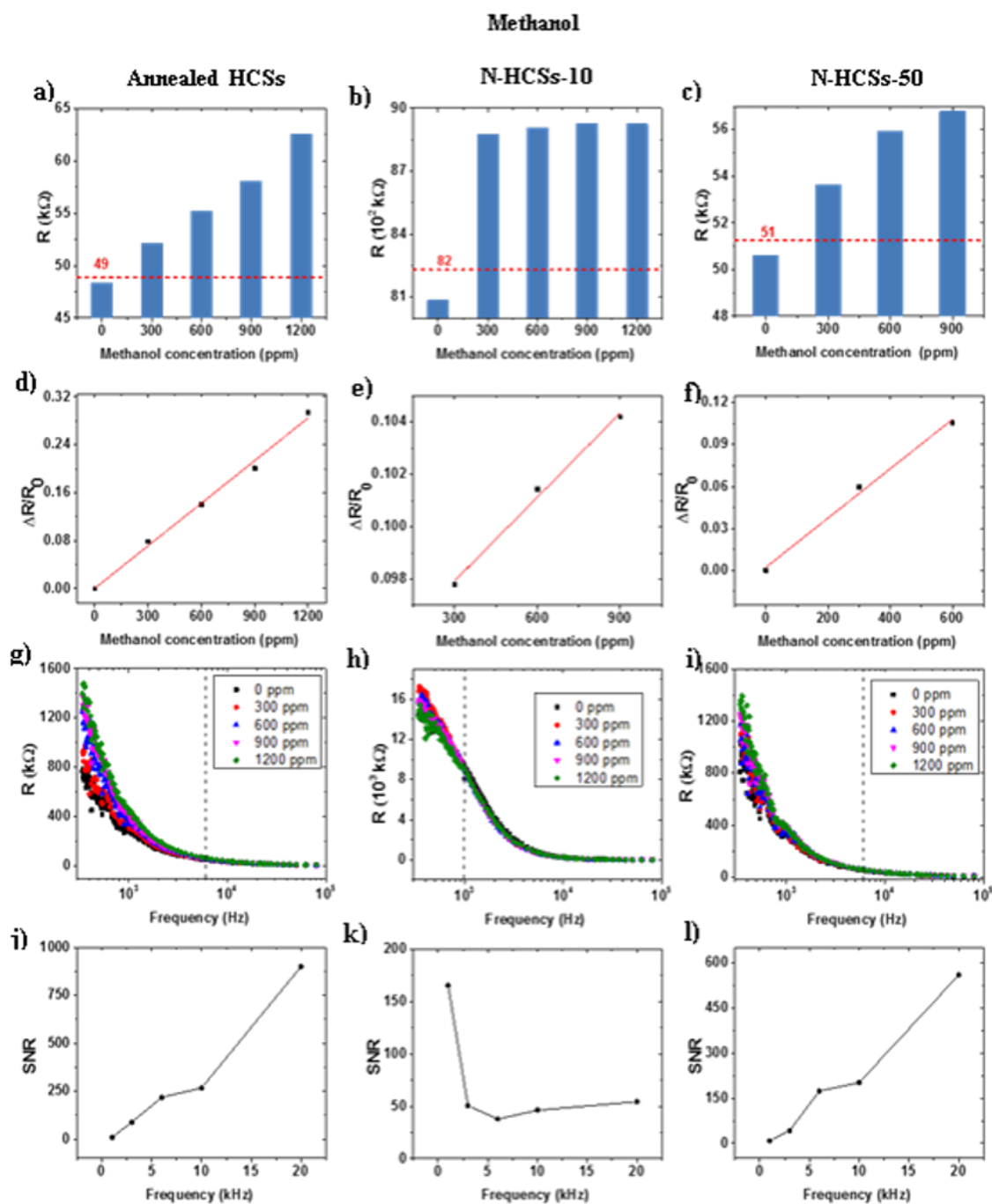
Figure S3: (a-c) Sensor resistance as a function of analyte (methanol) concentration, the red line indicates the estimated *LoD* resistance of the corresponding sensor; (d-f) response of the sensor versus analyte concentration; (g-i) sensor resistance dependence on frequency, dashed line indicates the optimum operating frequency and (j-l) sensor signal to noise ratio as a function of frequency. Corresponding results based on annealed HCSs, N-HCSs-10 and N-HCSs-50 are presented in the first, second and third column, respectively.
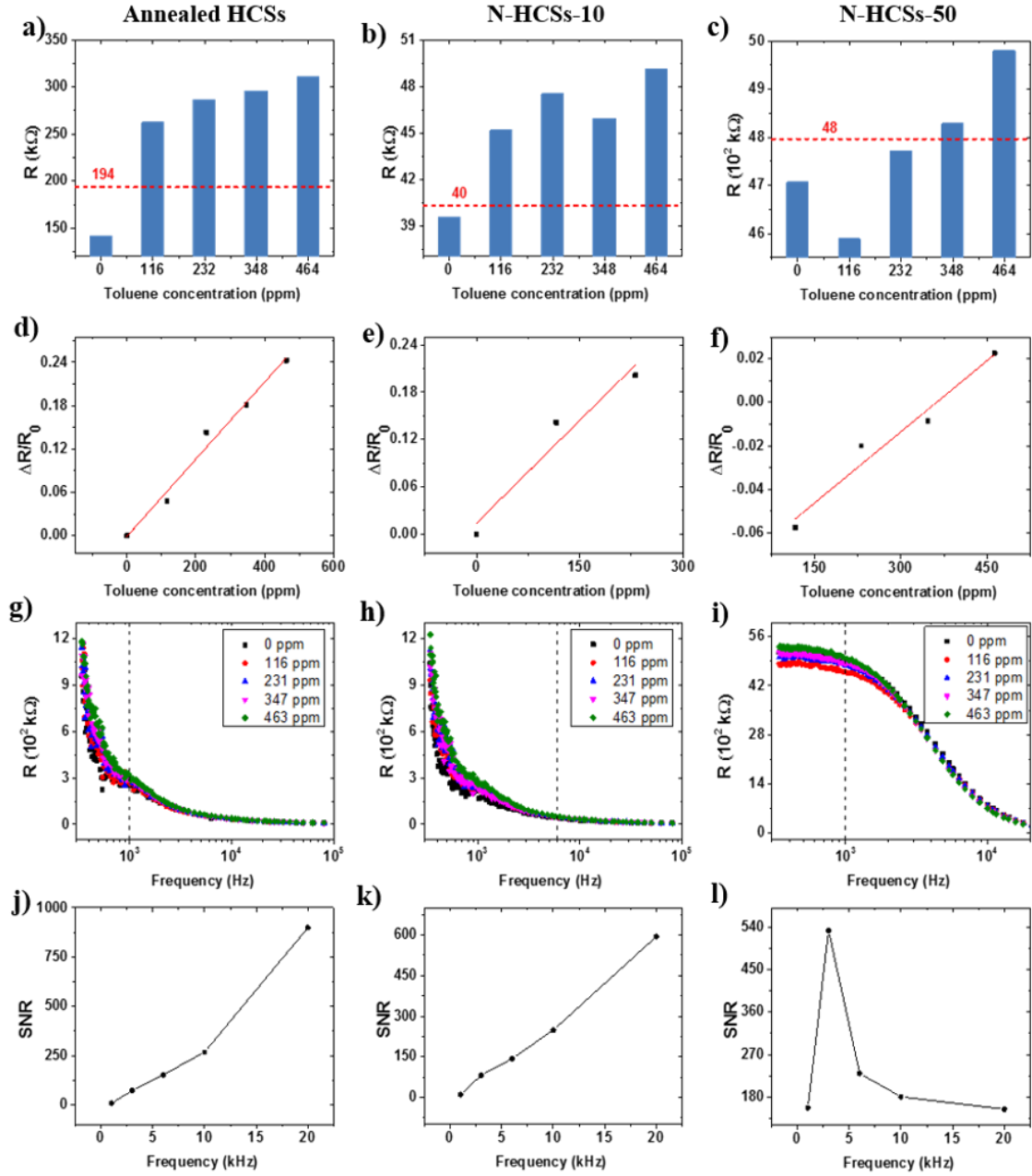
Toluene

Figure S4: (a-c) Sensor resistance as a function of analyte (toluene) concentration, the red line indicates the estimated *LoD* resistance of the corresponding sensor; (d-f) response of the sensor versus analyte concentration; (g-i) sensor resistance dependence on frequency, dashed line indicates the optimum operating frequency and (j-l) sensor signal to noise ratio as a function of frequency. Corresponding results based on annealed HCSs, N-HCSs-10 and N-HCSs-50 are presented in the first, second and third column, respectively.
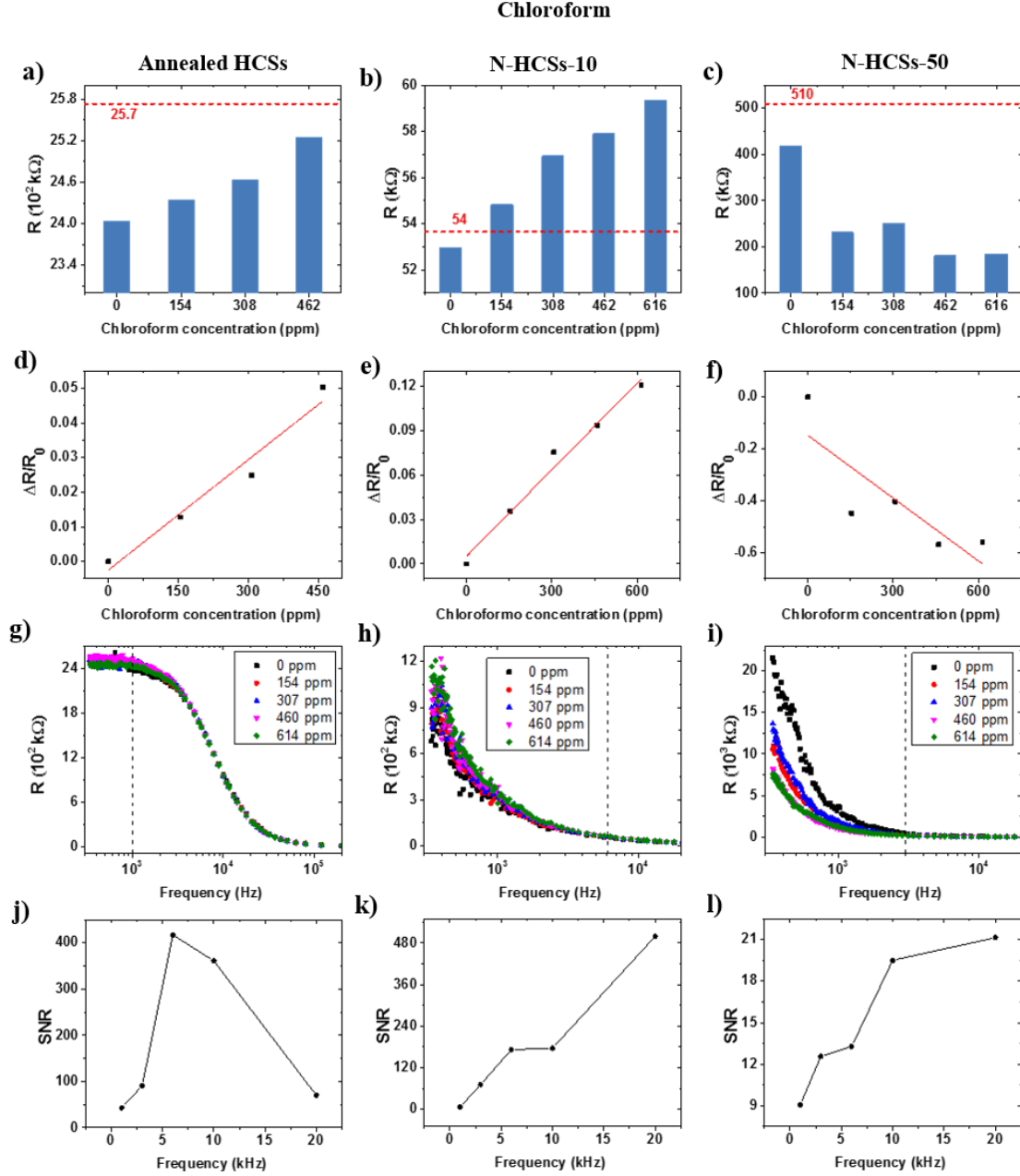
Figure S5: (a-c) Sensor resistance as a function of analyte (chloroform) concentration, the red line indicates the estimated *LoD* resistance of the corresponding sensor; (d-f) response of the sensor versus analyte concentration; (g-i) sensor resistance dependence on frequency, dashed line indicates the optimum operating frequency and (j-l) sensor signal to noise ratio as a function of frequency. Corresponding results based on annealed HCSs, N-HCSs-10 and N-HCSs-50 are presented in the first, second and third column, respectively.
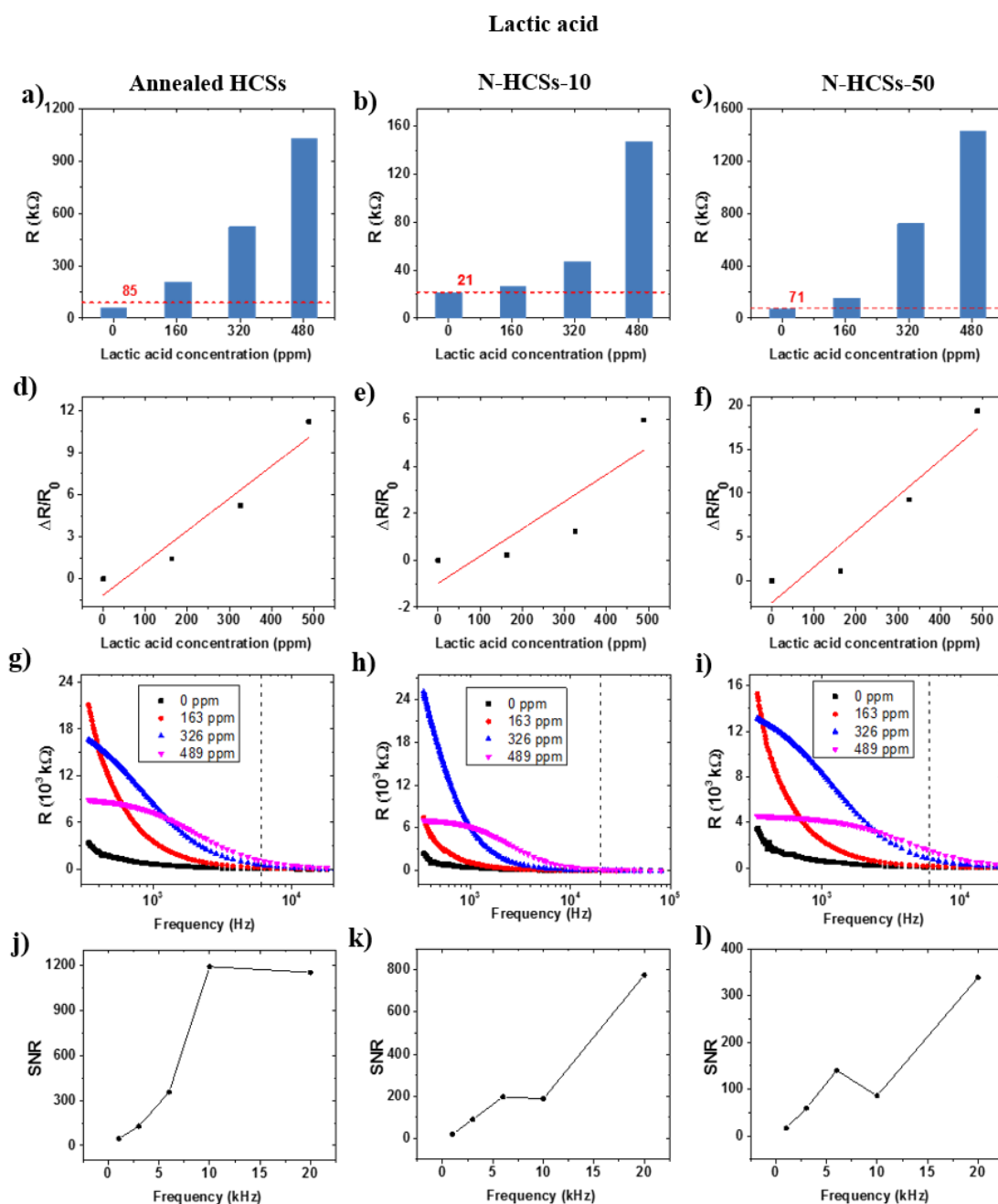
Lactic acid

Figure S6: (a-c) Sensor resistance as a function of analyte (lactic acid) concentration, the red line indicates the estimated *LoD* resistance of the corresponding sensor; (d-f) response of the sensor versus analyte concentration; (g-i) sensor resistance dependence on frequency, dashed line indicates the optimum operating frequency and (j-l) sensor signal to noise ratio as a function of frequency. Corresponding results based on annealed HCSs, N-HCSs-10 and N-HCSs-50 are presented in the first, second and third column, respectively.
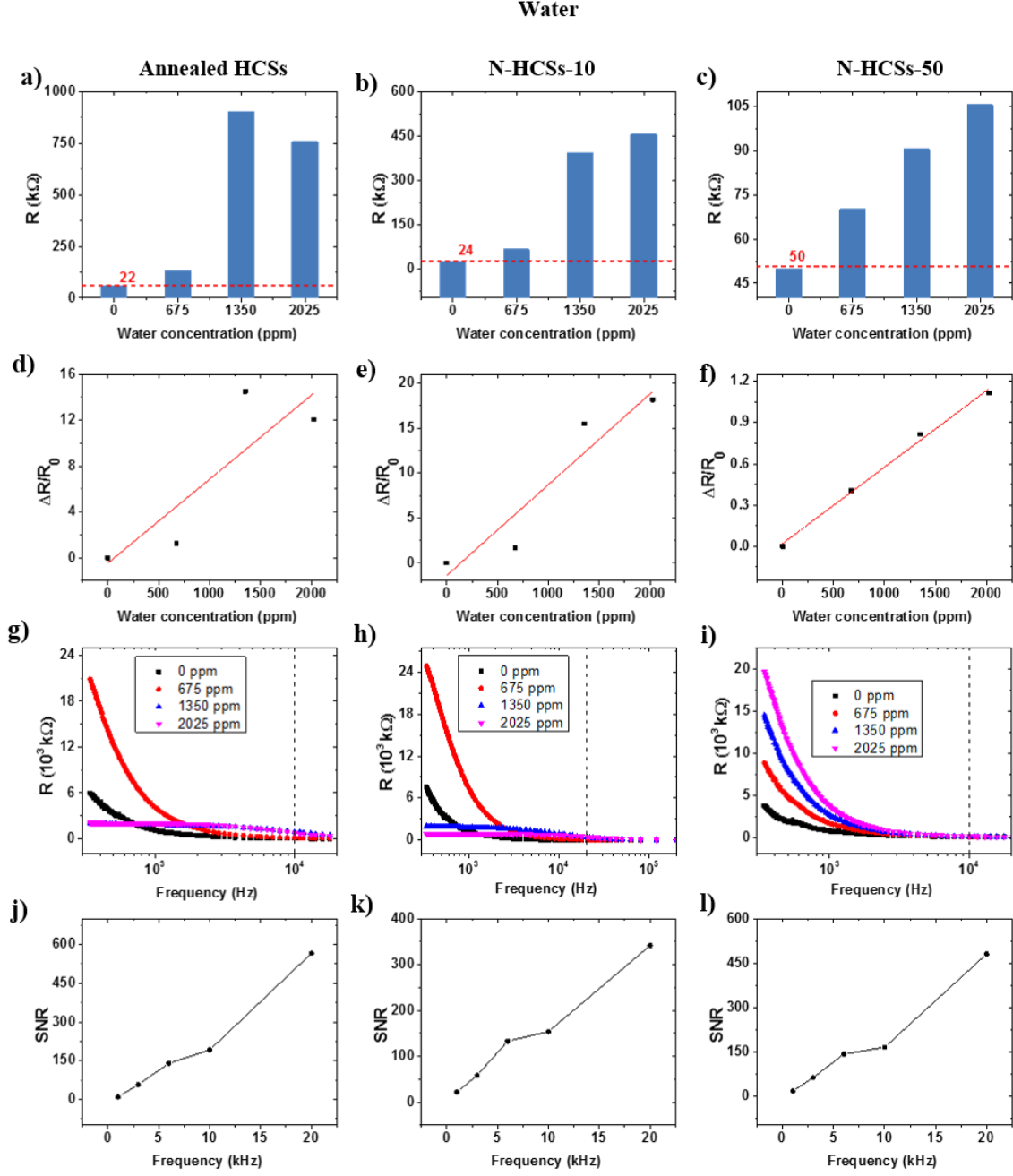
Figure S7: (a-c) Sensor resistance as a function of analyte (water) concentration, the red line indicates the estimated *LoD* resistance of the corresponding sensor; (d-f) response of the sensor versus analyte concentration; (g-i) sensor resistance dependence on frequency, dashed line indicates the optimum operating frequency and (j-l) sensor signal to noise ratio as a function of frequency. Corresponding results based on annealed HCSs, N-HCSs-10 and N-HCSs-50 are presented in the first, second and third column, respectively.
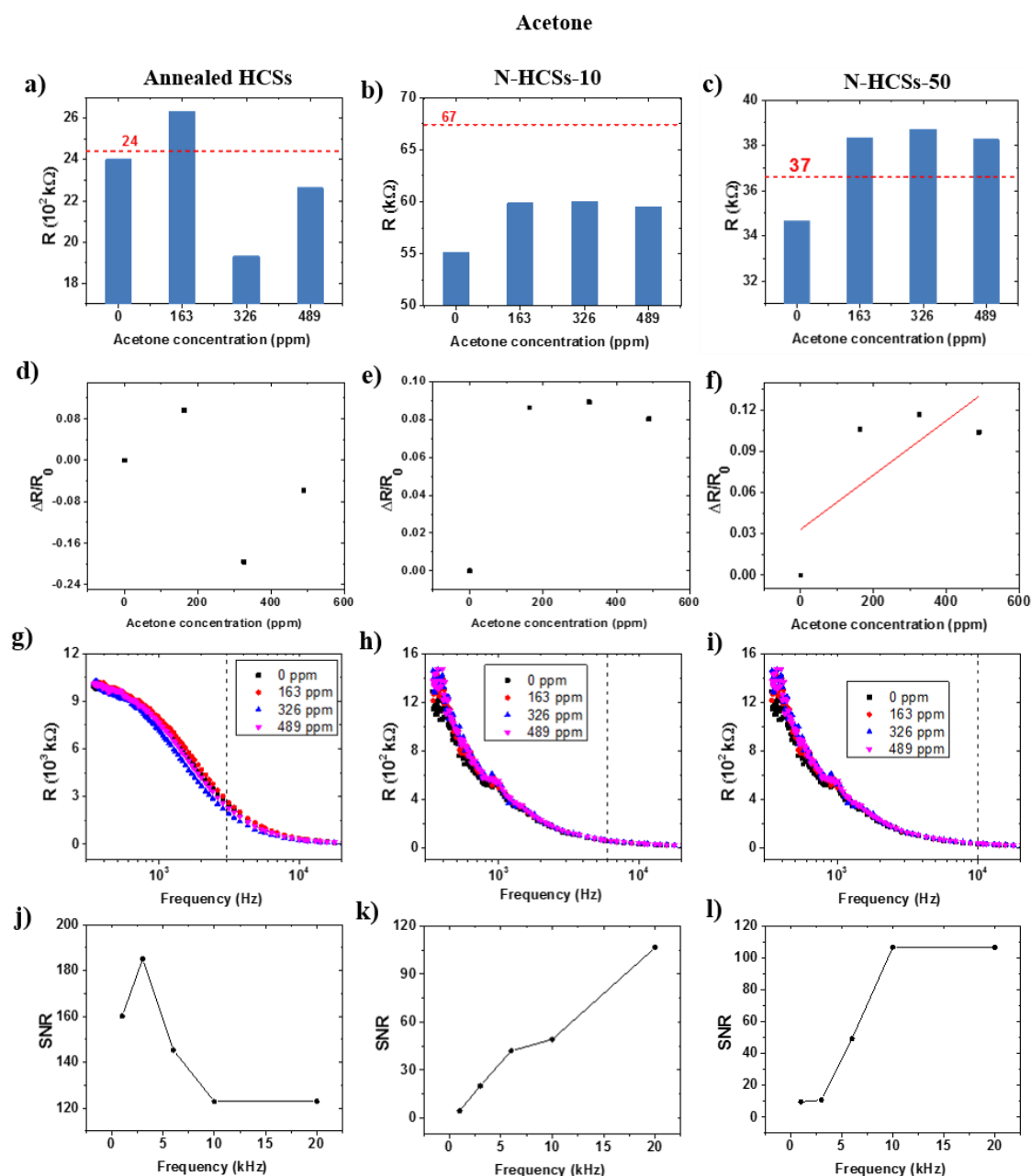
Acetone

Figure S8: (a-c) Sensor resistance as a function of analyte (acetone) concentration, the red line indicates the estimated *LoD* resistance of the corresponding sensor; (d-f) response of the sensor versus analyte concentration; (g-i) sensor resistance dependence on frequency, dashed line indicates the optimum operating frequency and (j-l) sensor signal to noise ratio as a function of frequency. Corresponding results based on annealed HCSs, N-HCSs-10 and N-HCSs-50 are presented in the first, second and third column, respectively.

References

1   M. Thommes, *Chemie Ing. Tech.*, 2010, **82**, 1059–1073.