Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Green-silver nanoparticles for drug transportation, bioactivities and a bacterium, *Bacillus subtilis*, mediated comparative nano-patterning feature

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Dynamic light scattering (DLS) study and Zeta potential distribution of SHGel capped Ag-NPs in water:

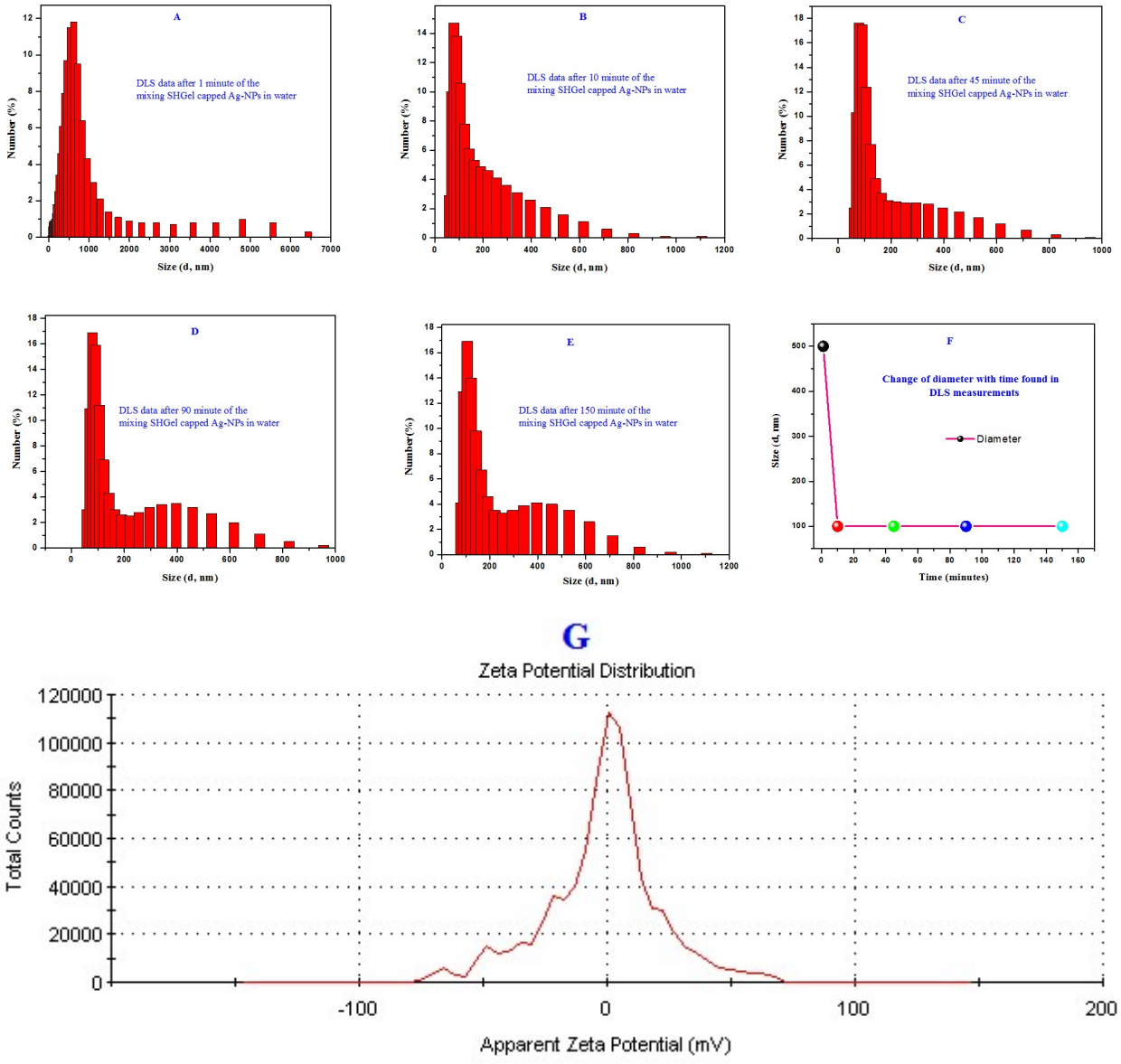

Figure S1. (A-E) Size distribution of the aqueous solution of SHGel capped Ag-NPs in different times (The time is mentioned in the figures). **(F)** Change of the size of SHGel capped Ag-NPs with time in water medium is given here. **(G)** Zeta potential distribution of the SHGel capped Ag-NPs in water medium.

From Dynamic Light Scattering and Zeta potential data it is clear that the SHGel capped Ag-NPs are weekly negative charged (-1.53 mV) and the corresponding time dependent diameter measurement shows an average diameter of ~100 nm in the time range of 10-150 minutes. Initial

diameter of the SHGel capped Ag-NPs are in the range of ~500 nm due to their slow dissolution through several fragmentation of the Ag-NPs embedded solid SHGel to individual SHGel encapsulated Ag-NP. Though the SHGel encapsulated Ag-NPs are weekly charged but they are quite stable due to their encapsulation inside SHGel which prevents them from eventual agglomeration. These DLS outputs are inconsistent with the obtained TEM results (Fig. 1) as the TEM images show an average diameter of the generated SHGel encapsulated Ag-NPs are ~20 nm. So, the DLS data might be for the composite SHGel capped silver nanoparticles. In comparison to DLS data, TEM images give a much reliable data for exact size analysis of the embedded silver nanoparticles inside SHGel network.

Luminescent features of SHGel capped Silver nanoparticles:

The luminous nature of SHGel capped silver nanoparticles has also been characterized through fluorescence spectroscopic study and fluorescence microscopic imaging (Fig. S2).

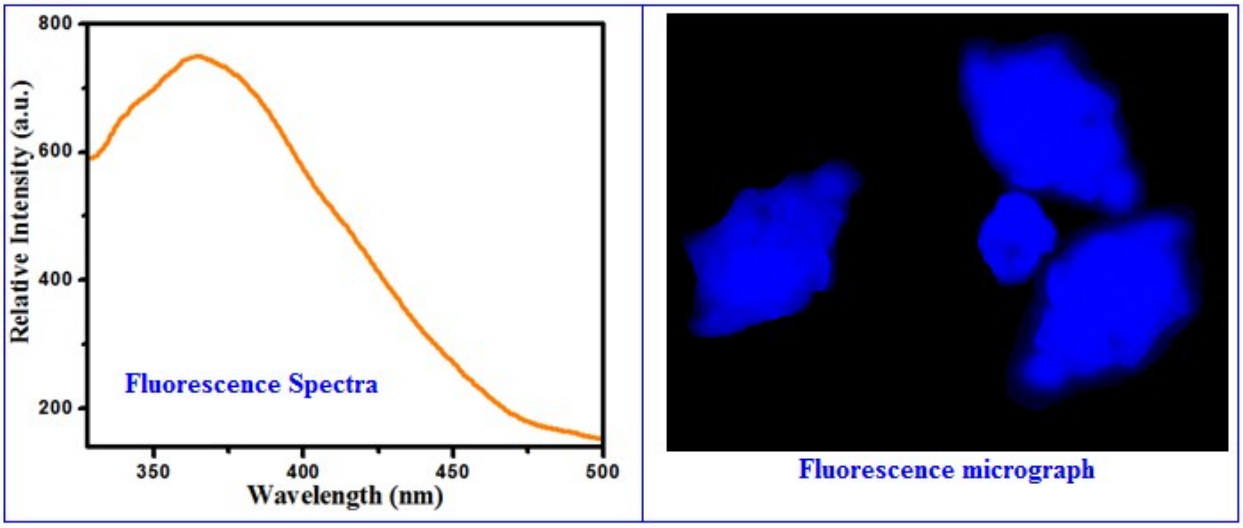

Figure S2. Fluorescence nature of SHGel capped Ag-NPs.

FTIR spectroscopic study of SHGel capped Ag-NPs and drug composites:

Infrared spectral data infer that the nanoparticles are strongly interactive with several drugs including streptomycin, albendazole, ivemectin and diethylcarbamazine (Fig. S3-S6).

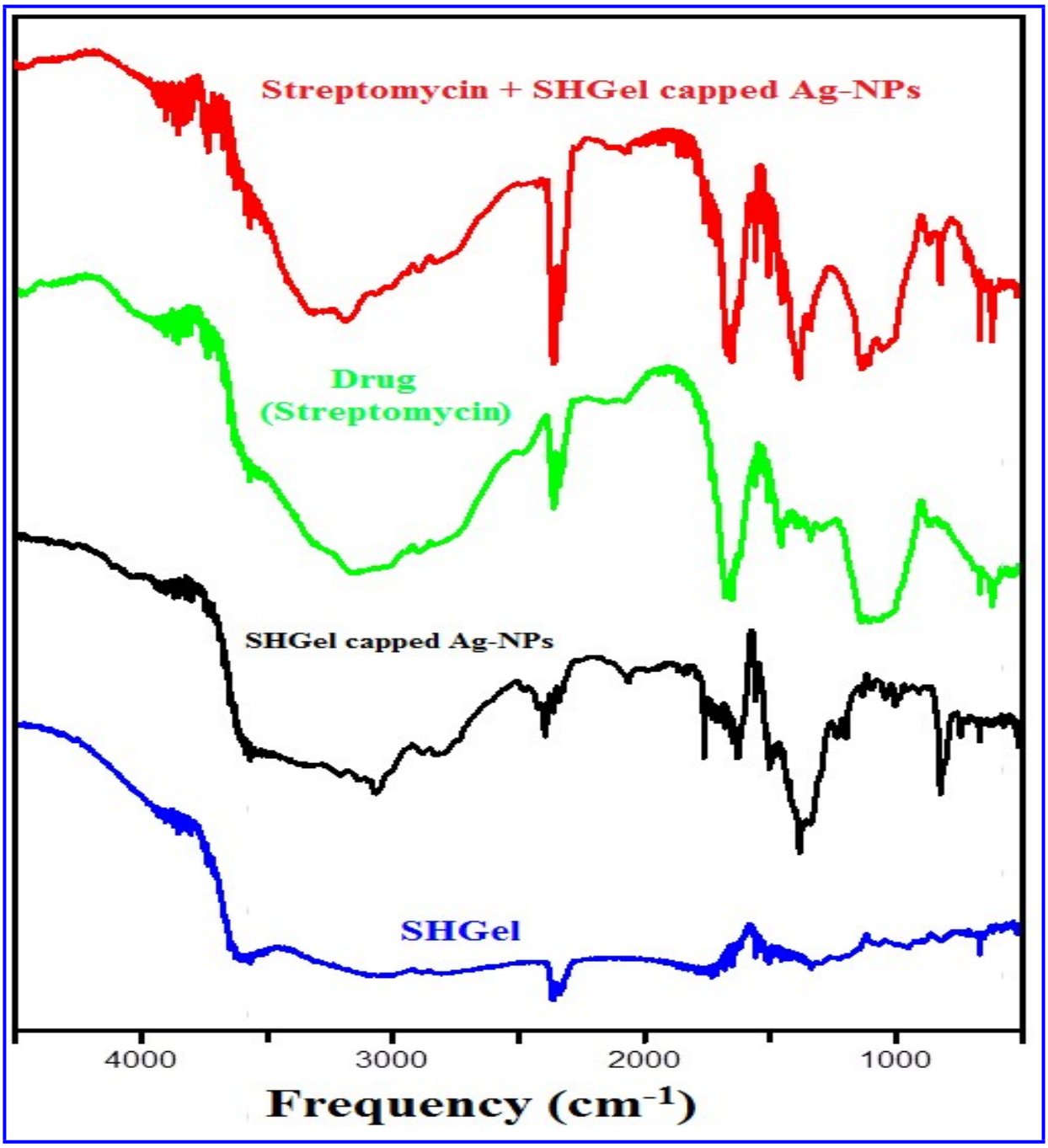

Figure S3. IR spectral results for chemical interactions between streptomycin drug and SHGel capped Ag-NPs.

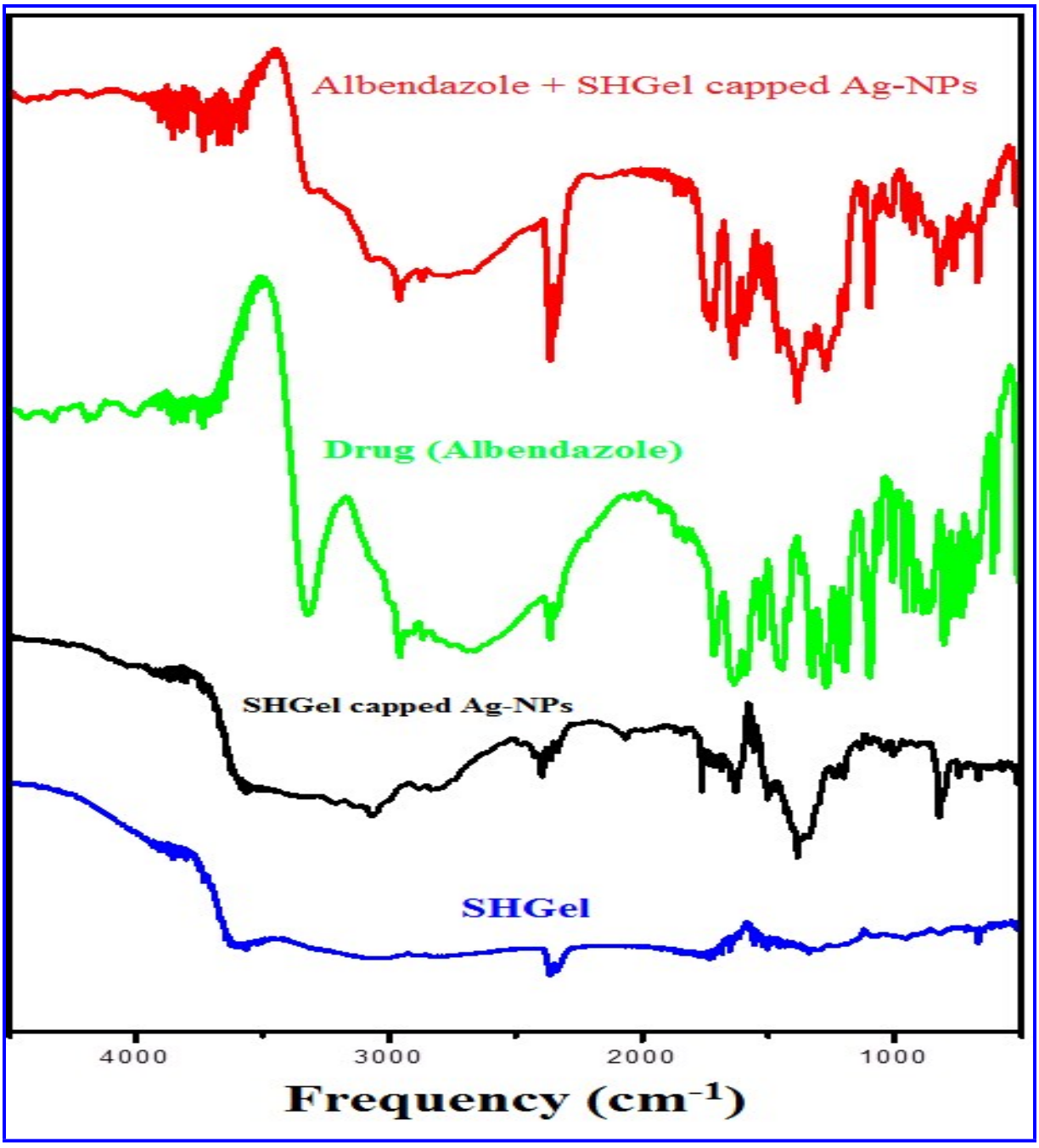

Figure S4. IR spectral results for chemical interactions between albendazole drug and SHGel capped Ag-NPs.

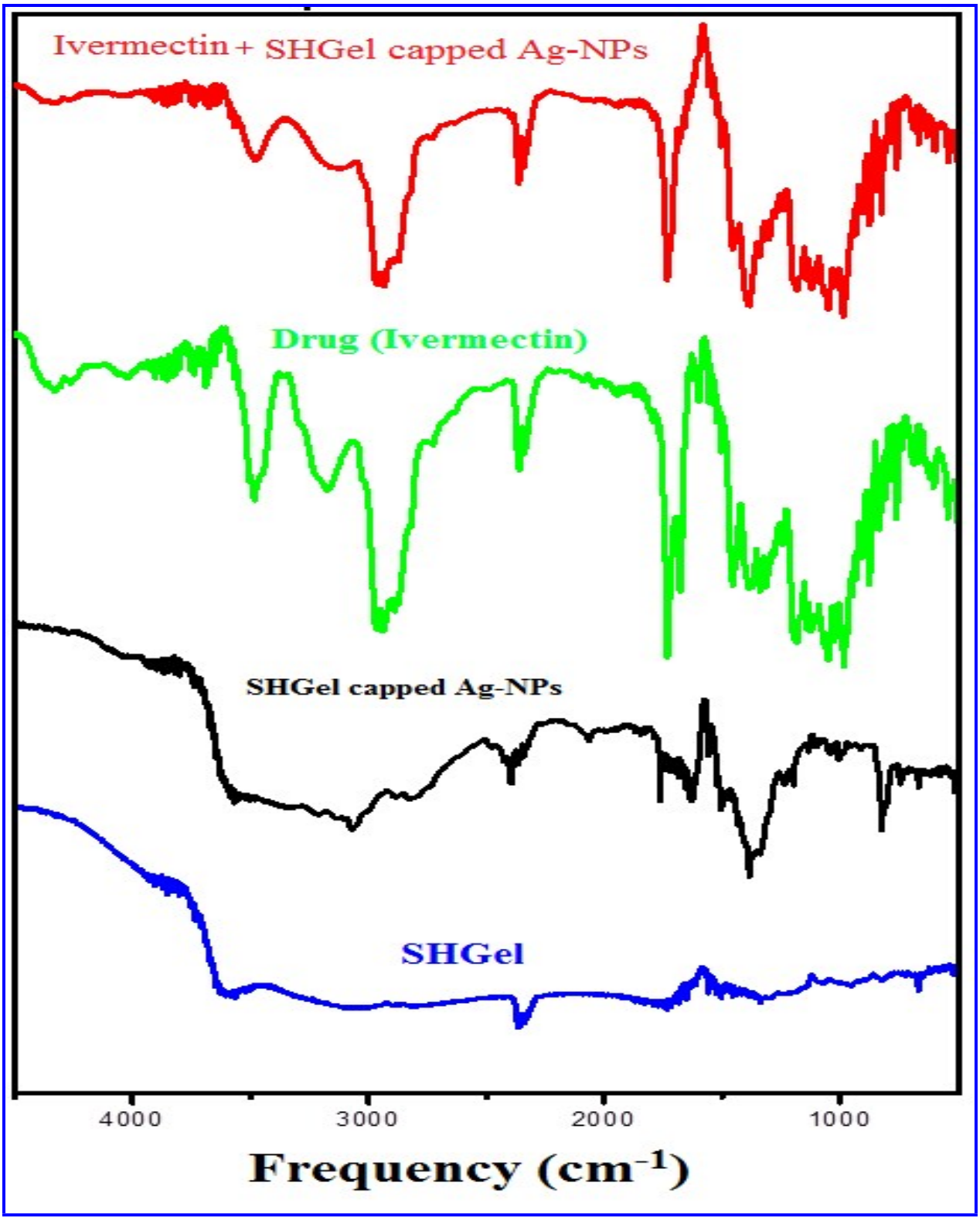

Figure S5. IR spectral results for chemical interactions between ivemectin drug and SHGel capped Ag-NPs.

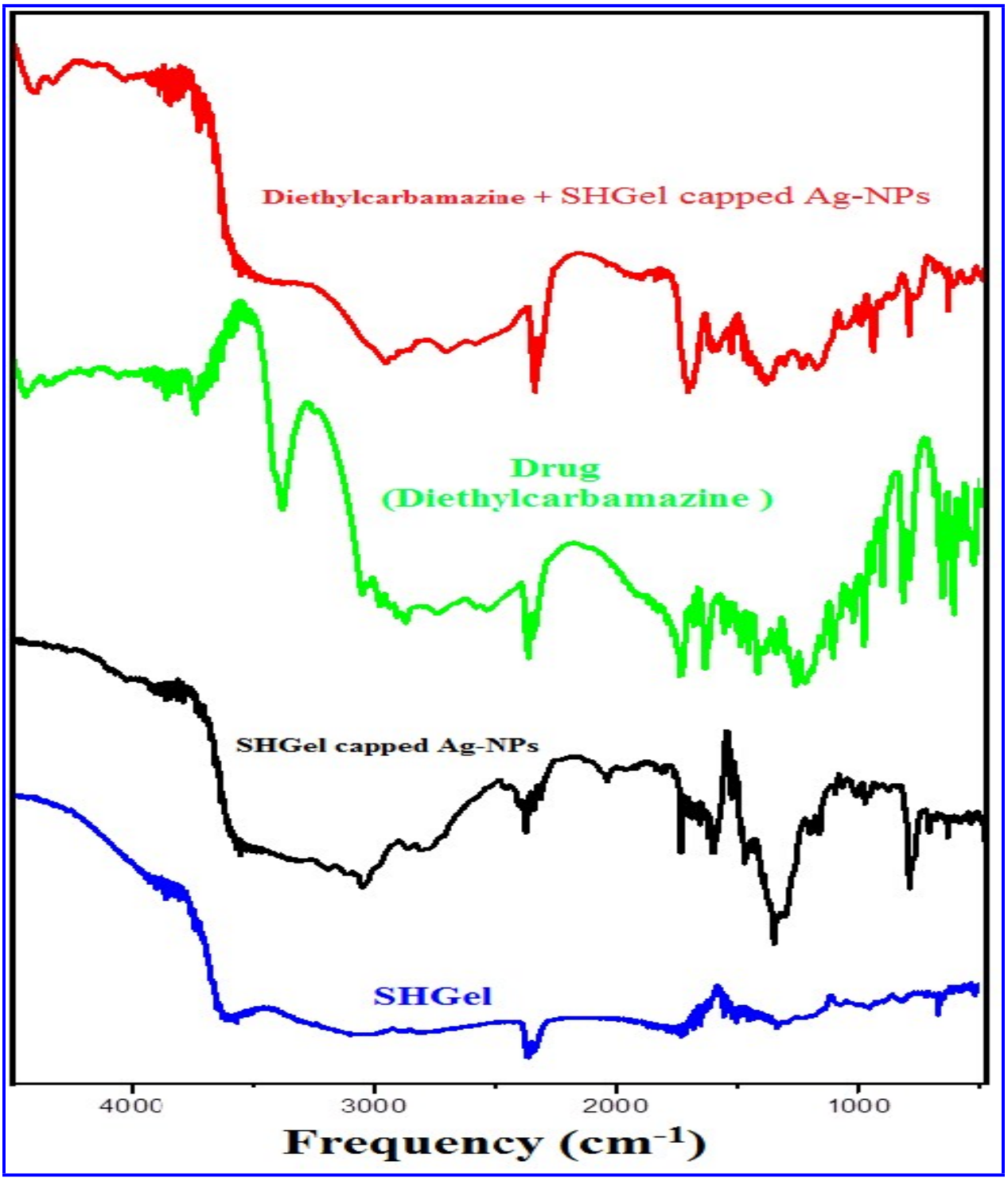

Figure S6. IR spectral results for chemical interactions between diethylcarbamazine drug and SHGel capped Ag-NPs.

Assessment of cytotoxicity

***In vitro* assessment:**

$$\% \text{ Cell viability} = \frac{\text{Absorbance of sample}}{\text{Absorbance of control}} \times 100$$

***In vivo* assessment:**

Detailed *in vivo* toxicity analysis has explained in Table S1.

Table S1. Hematological and serological parameters in exposed wistar rats for toxicity evaluation[1]

Parameters	Group I (Cont.)	Group II (Interdermal)	Group III (Interperitoneal)	Group IV (Gastatory)	Group V (SHGel capped Ag-NPs)
W.B.C. (per cmm)	6700 ± 375	6900 ± 286	7100 ± 355	7300 ± 327	4700 ± 273
Neutrophils (%)	52 ± 13	70 ± 9	67 ± 11	69 ± 8	61 ± 11
Lymphocytes (%)	45 ± 11	25 ± 6	30 ± 8	28 ± 9	37 ± 6
Basophils (%)	00	00	00	00	00
Eosinophils (%)	02 ± 1	03 ± 2	02 ± 2	02 ± 1	01 ± 1
Monocytes (%)	01 ± 1	02 ± 1	01 ± 1	01 ± 1	01 ± 1
Haemoglobin (gm%)	12.0 ± 1.5	10.5 ± 2	11.6 ± 2.4	11.7 ± 1.6	11.0 ± 2.2
Bilirubin Total (mg%)	0.78 ± 0.11	0.94 ± 0.09	0.85 ± 0.14	1.0 ± 0.09	0.97 ± 0.18
Bilirubin conjugated (mg%)	0.25 ± 0.06	0.37 ± 0.08	0.26 ± 0.08	0.48 ± 0.04	0.71 ± 0.09
Bilirubin non-conjugated (mg%)	0.53 ± 0.08	0.57 ± 0.11	0.59 ± 0.06	0.52 ± 0.09	0.26 ± 0.06
Total Protein (gm%)	7.5 ± 1.1	7.0 ± 0.7	7.8 ± 0.9	7.2 ± 1.2	7.3 ± 0.5
Albumin (gm%)	4.3 ± 0.6	4.0 ± 0.6	4.5 ± 0.4	4.0 ± 0.7	4.1 ± 0.8
Globulin (gm%)	3.2 ± 0.7	3.0 ± 0.5	3.3 ± 0.8	3.2 ± 0.3	3.2 ± 0.6
S.G.P.T. (I.U./L)	37 ± 12	28 ± 7	40 ± 11	39 ± 4	41 ± 8
S.G.O.T. (I.U./L)	32 ± 11	20 ± 9	35 ± 11	31 ± 14	36 ± 7
Alk. Phosphate (I.U./L)	92 ± 17	105 ± 9	85 ± 12	102 ± 18	137 ± 12

(For the corresponding permissible ranges of these parameters please consult literature values.[2])

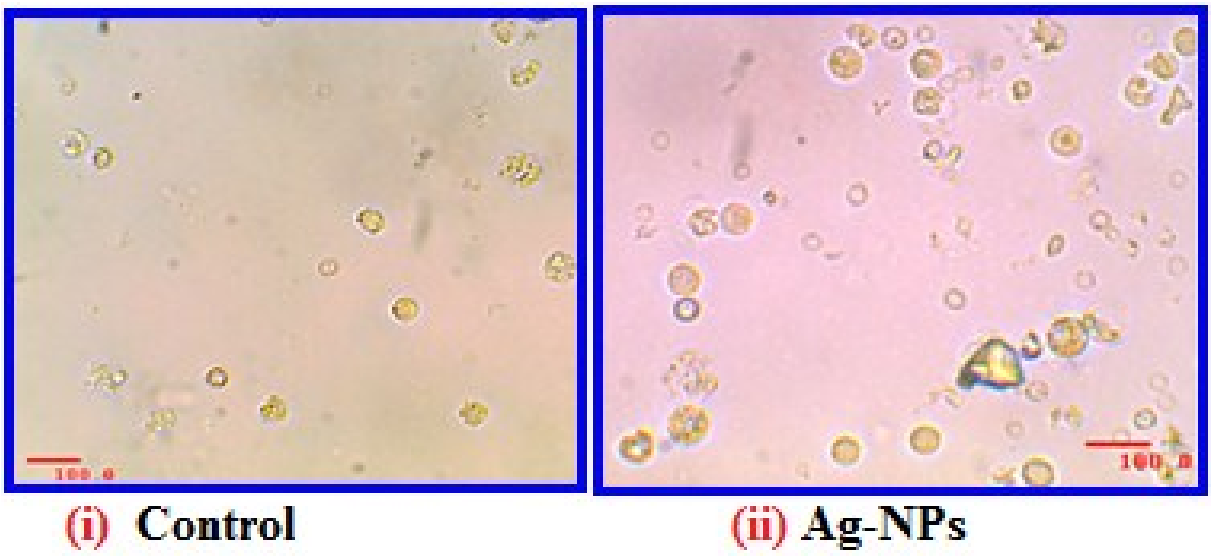

Figure S7. Bio-compatibility study: Phase contrast microscopic images of (i) control rat macrophages; (ii) macrophages treated with SHGel capped Ag-NPs.

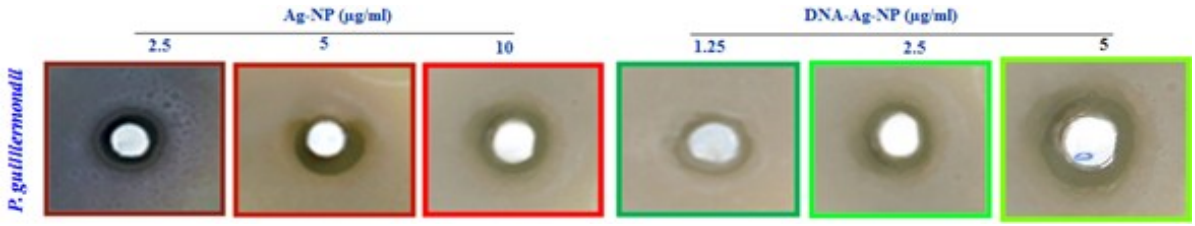

Figure S8. Dose dependent fungicidal effect of SHGel capped Ag-NPs and DNA-hydrogel capped Ag-NPs on a pathogenic fungus, *Pichia guilliermondii*: First three from left side show effect of SHGel capped Ag-NPs with concentration range 2.5, 5 & 10 µg/ml and other three explore that the effect of DNA-hydrogel capped Ag-NPs with concentrations of 1.25, 2.5 & 5 µg/ml.

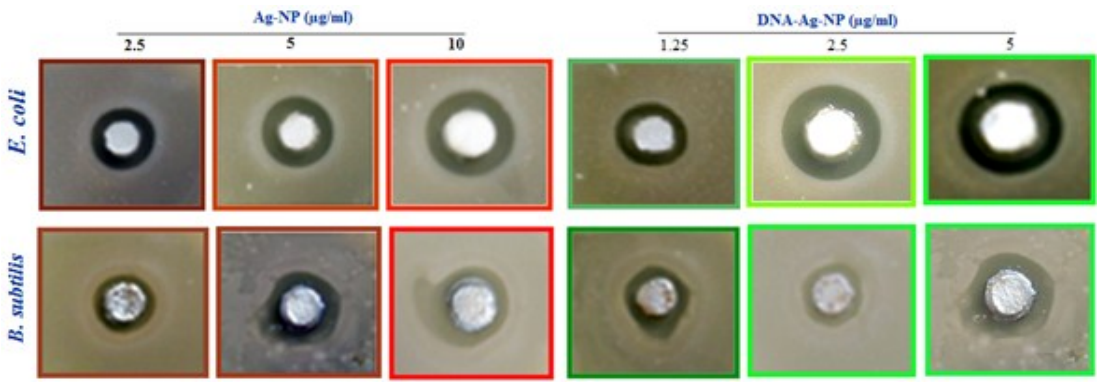

Figure S9. Dose dependent antimicrobial activity of SHGel capped Ag-NPs (with concentration 2.5, 5 & 10 µg/ml) and DNA-hydrogel capped Ag-NPs (with concentration 1.25, 2.5 & 5 µg/ml) against: Gram -ve bacteria (*Escherichia coli* DH5α) and Gram +ve bacteria (*Bacillus subtilis*).

Reference:

1 B. Dey, R. K. Mondal, S. Mukherjee, B. Satpati, N. Mukherjee, A. Mandal, D. Senapati and S. P. S. Babu, A supramolecular hydrogel for generation of a benign DNA-hydrogel, *RSC Adv.*, 2015, **5**, 105961-105968.

2 Exotic Animal Companion Medicine Handbook for Veterinarians, Johnson-Delaney, C., 1996, Zoological Education Network.