α-Substituted Phthalocyanines Based on Metal-Induced H- or J-Type Aggregation for Silver and Palladium Ions: Synthesis, Fluorescence, Antimicrobial and Antioxidant Properties

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Content of supporting information

Fig. S15 Minimum Inhibitory Concentration (MIC) results of the synthesized phthalocyanine compounds (A) and their doped Ag(I) and Pd(II) ion forms (B).

Fig. S16 Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *E.coli*, K: control (DMF), AM10: Ampicillin 10 µg

Fig. S17 Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *E. coli* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

Fig. S18 Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *E. coli* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

Fig. S19 Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *E. coli* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

Fig. S20 Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *S. aureus,* K: control (DMF), AM10: Ampicillin 10 µg

Fig. S21 Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *S. aureus* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

Fig. S22 Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *S. aureus* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

Fig. S23 Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *S. aureus* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

Fig. S24 Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *B. subtilis,* K: control (DMF), AM10: Ampicillin 10 µg

Fig. S25 Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *B. subtilis* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

Fig. S26 Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *B. subtilis* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

Fig. S27 Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *B. subtilis* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

Fig. S28 Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *C.albicans,* **K**: control (DMF), **FLU25**: Fluconazole 25 µg

Fig. S29 Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *C.albicans* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

Fig. S30 Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *C.albicans* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

Fig. S31 Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *C.albicans* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

Fig. S32 Compound **3** - *E.coli* MIC test results (concentration of compound **3** in tubes from left to right: 100-75-50-25-12.5-6.25-0 µg/mL; K = control; number 7 refers to compound **3**)

Fig. S33 Compound **5** - *E.coli* MIC test results (concentration of compound **5** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 9 refers to compound **5**)

Fig. S34 Compound **3+Ag** - *E.coli* MIC test results (concentration of compound **3+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 7Ag refers to compound **3+Ag**)

Fig. S35 Compound **4+Ag** - *E.coli* MIC test results (concentration of compound **4+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 8Ag refers to compound **4+Ag**)

Fig. S36 Compound **5+Ag** - *E.coli* MIC test results (concentration of compound **5+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 9Ag refers to compound **5+Ag**)

Fig. S37 Compound **3+Pd** - *E.coli* MIC test results (concentration of compound **3+Pd** in tubes from left to right: 100-75-50-25-12.5-6.25-0 μg/mL; K = control; number 7Pd refers to compound **3+Pd**)

Fig. S38 Compound **5+Pd** - *E.coli* MIC test results (concentration of compound **5+Pd** in tubes from left to right: 100-75-50-25-12.5-6.25-0 μg/mL; K = control; number 9Pd refers to compound **5+Pd**)

Fig. S39 Compound **4** - *S.aureus* MIC test results (concentration of compound **4** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 8 refers to compound **4**)

Fig. S40 Compound **5** - *S.aureus* MIC test results (concentration of compound **5** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 9 refers to compound **5**)

Fig. S41 Compound **3+Ag** - *S.aureus* MIC test results (concentration of compound **3+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 7Ag refers to compound **3+Ag**)

Fig. S42 Compound **4+Ag** - *S.aureus* MIC test results (concentration of compound **4+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 8Ag refers to compound **4+Ag**)

Fig. S43 Compound **5+Ag** - *S.aureus* MIC test results (concentration of compound **5+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 9Ag refers to compound **5+Ag**)

Fig. S44 Compound **4+Pd** - *S.aureus* MIC test results (concentration of compound **4+Pd** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 8Pd refers to compound **4+Pd**)

Fig. S45 Compound **5+Pd** - *S.aureus* MIC test results (concentration of compound **5+Pd** in tubes from left to right: 100-50-25-12.5-6.25-0 μg/mL; K = control; number 9Pd refers to compound **5+Pd**)

Fig. S46 Compound **4** - *C.albicans* MIC test results (concentration of compound **4** in tubes from left to right: 100-50-25-12.5-6.25 μg/mL; number 8 refers to compound **4**)

Fig. S47 Compound **5+Ag** - *C.albicans* MIC test results (concentration of compound **5+Ag** in tubes from left to right: 100-50-25-12.5-6.25 μg/mL; number 9+Ag refers to compound **5+Ag**)

Fig. S48 *C.albicans* MIC test results of controls (DMF amount in tubes from left to right: adjusted to match the solvent amounts of phthalocyanine compounds at a concentration of 100-50-25-12.5-6.25 μg/mL)

Fig. S49 Compound **3** - *E.coli* MBC test results (number 7 refers to compound **3)**

Fig. S50 Compound **5** - *E.coli* MBC test results (number 9 refers to compound **5)**

Fig. S51 Compound **3+Ag** - *E.coli* MBC test results (number 7Ag refers to compound **3+Ag)**

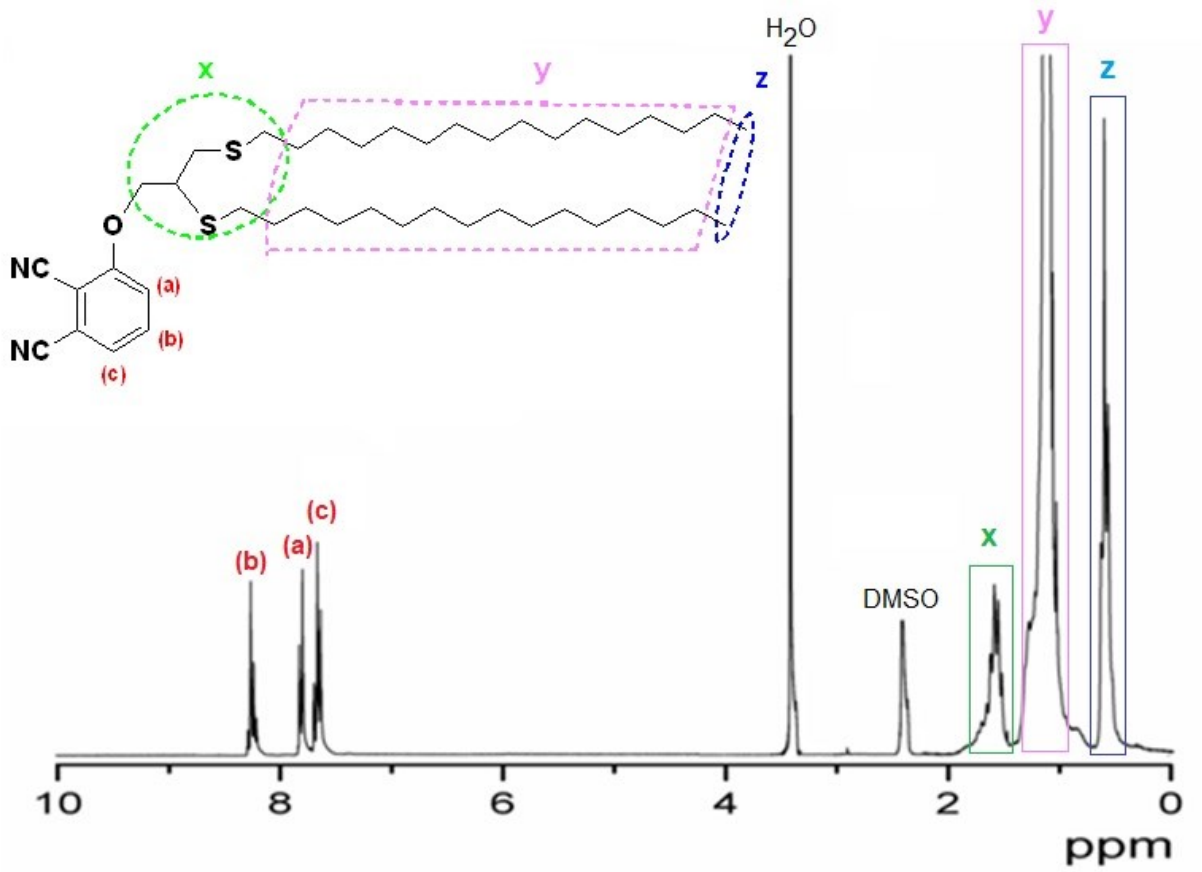

Fig S1. ^{1}H-NMR spectrum of compound **(2)**

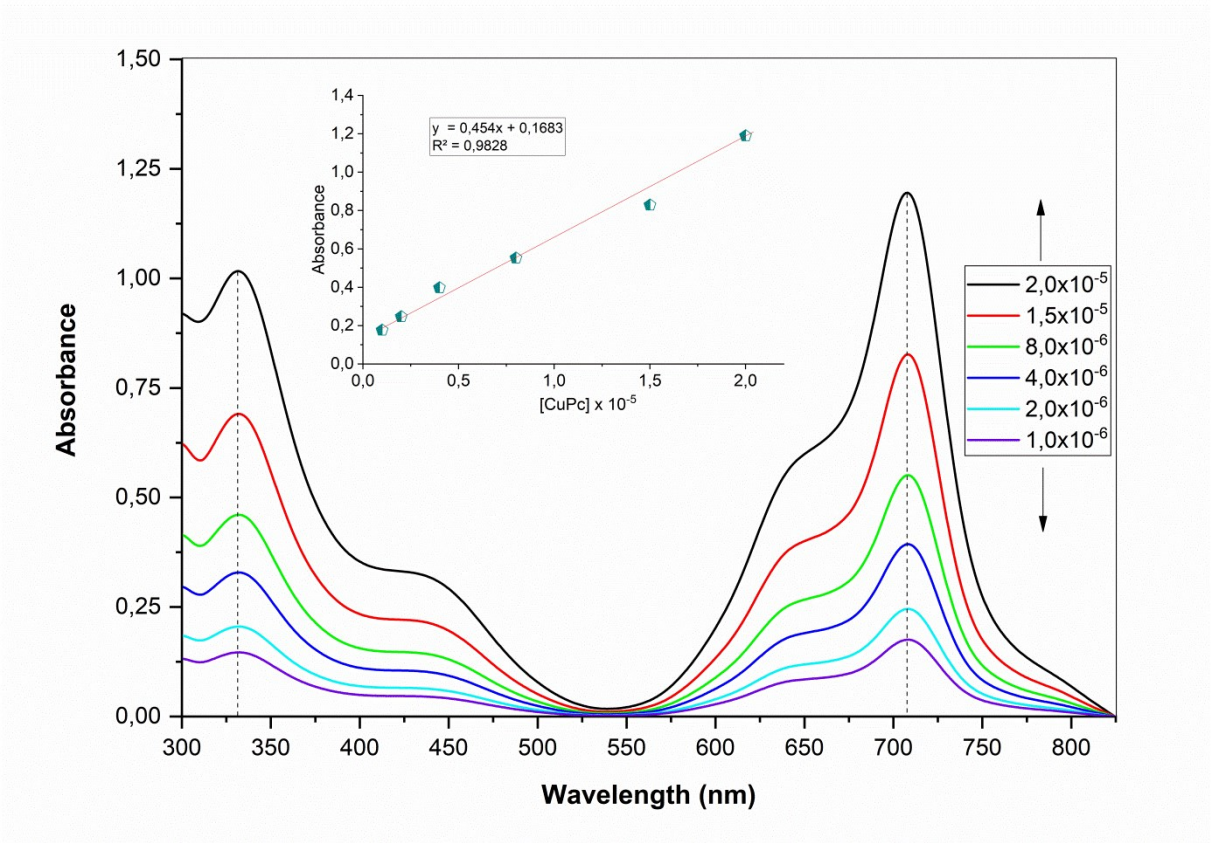

Fig. S2 Electronic spectra of CuPc **(3)** in THF at different concentrations (inset: plot of Q band absorbance versus concentration)

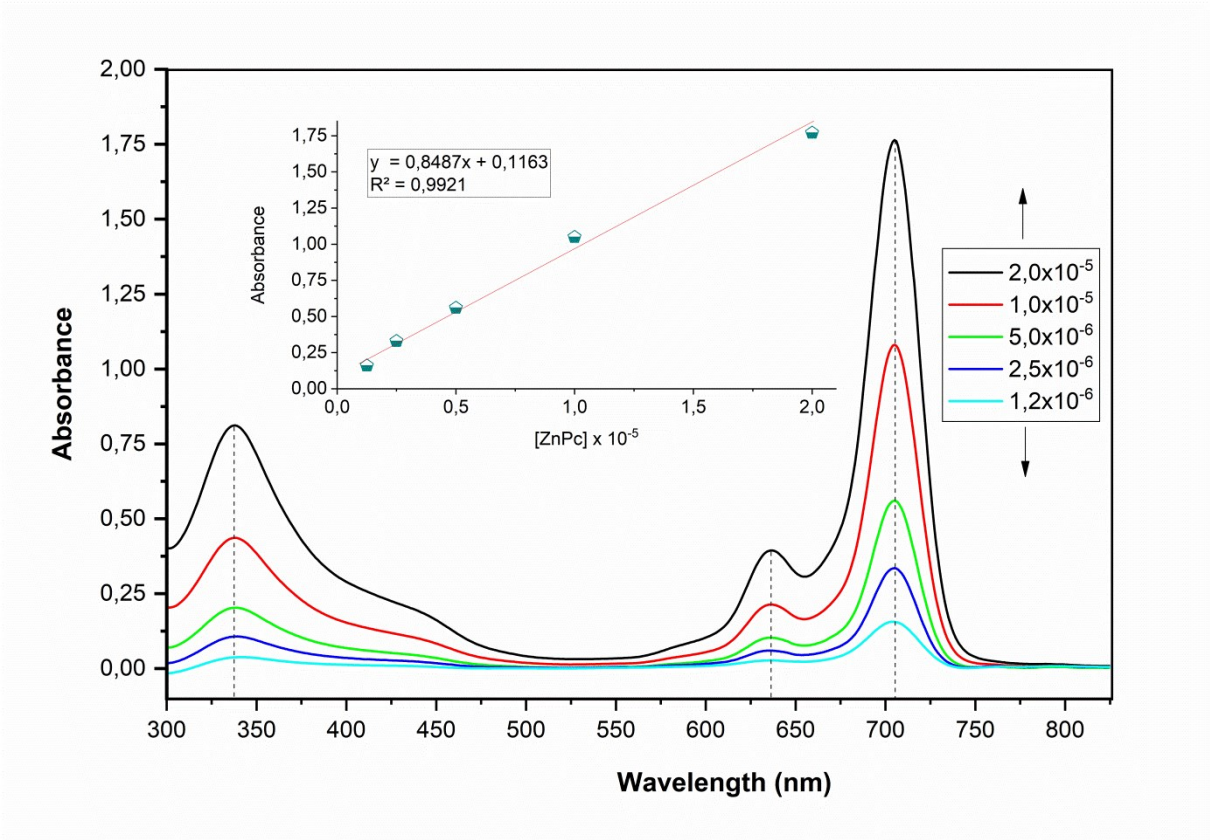

Fig. S3 Electronic spectra of ZnPc **(4)** in THF at different concentrations(inset: plot of Q band absorbance versus concentration).

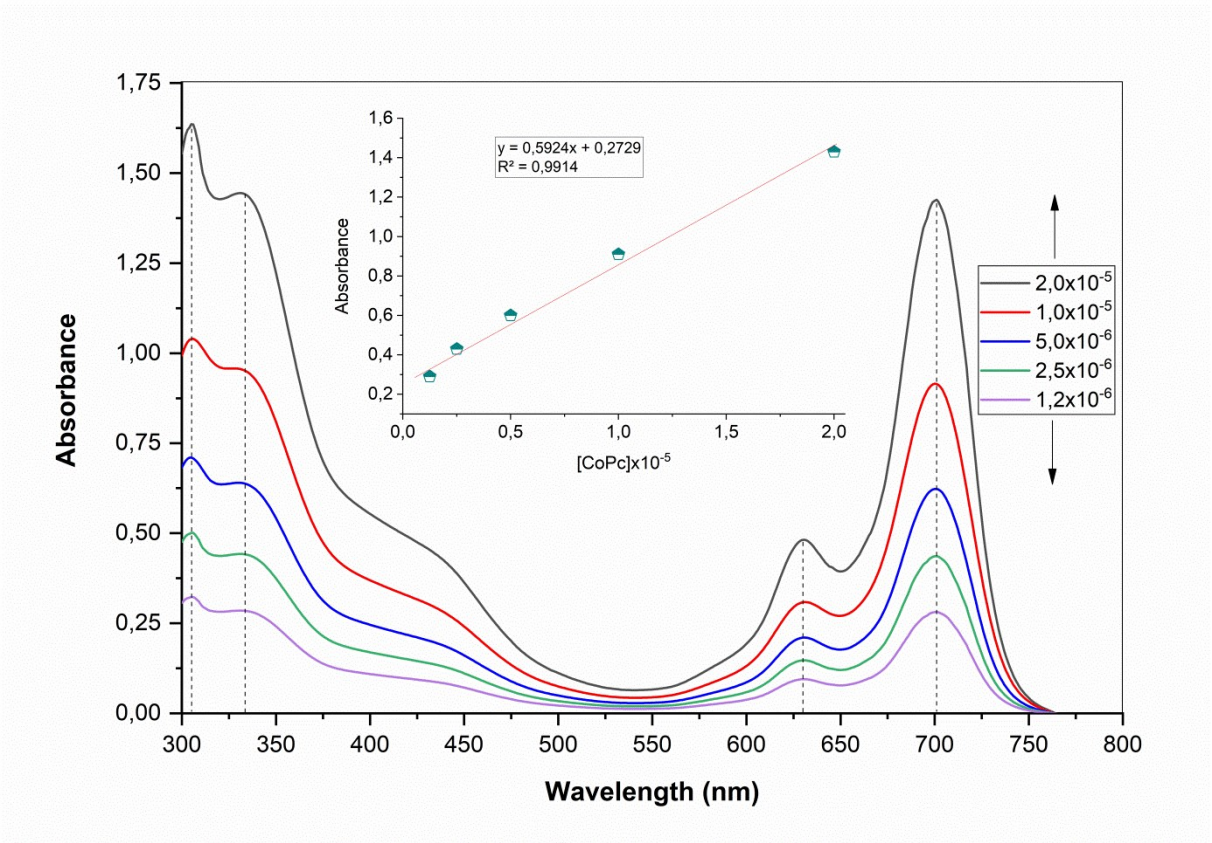

Fig. S4 Electronic spectra of CpPc **(5)** in THF at different concentrations (inset: plot of Q band absorbance versus concentration).

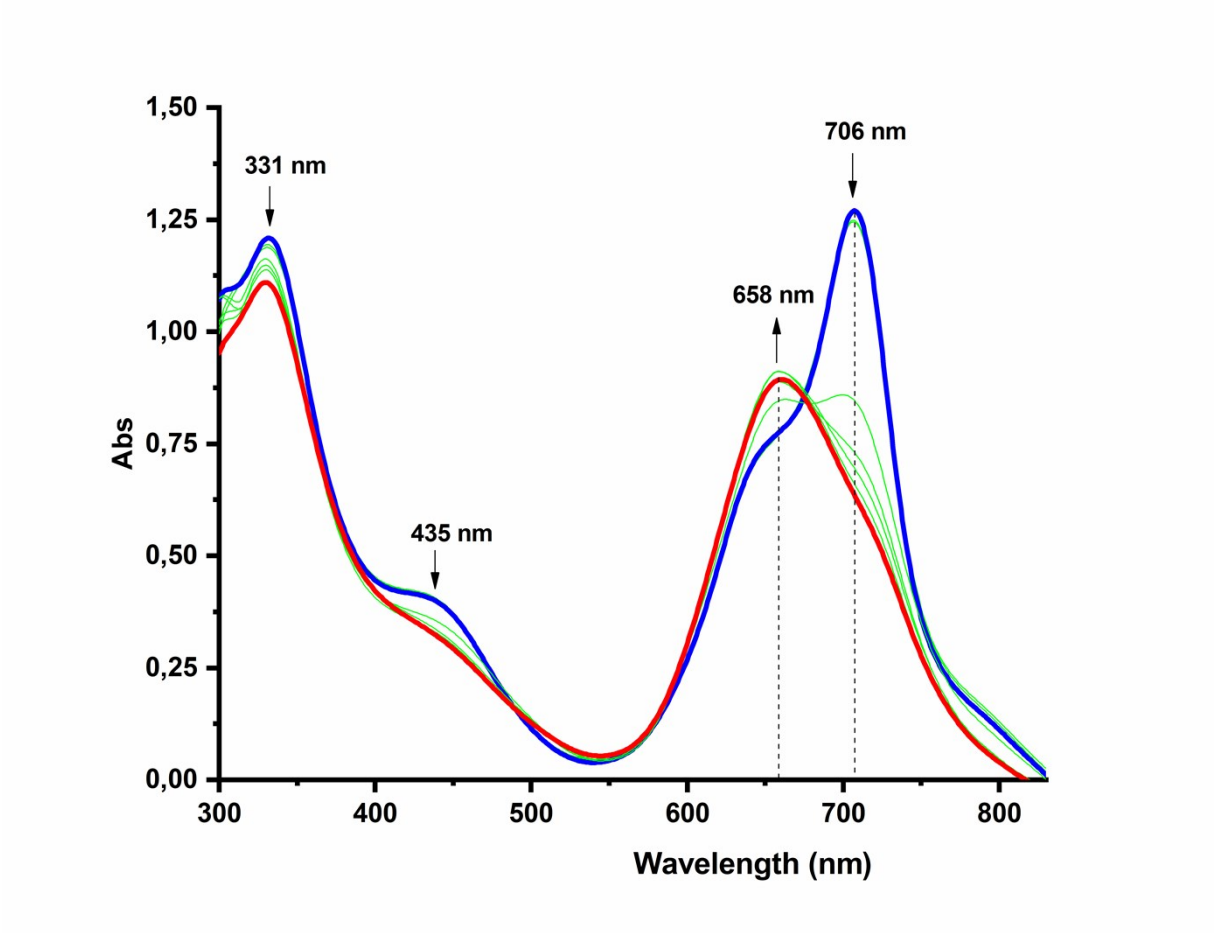

Fig. S5 Electronic spectra of CuPc **(3)** during the titration with Ag(I) ions.

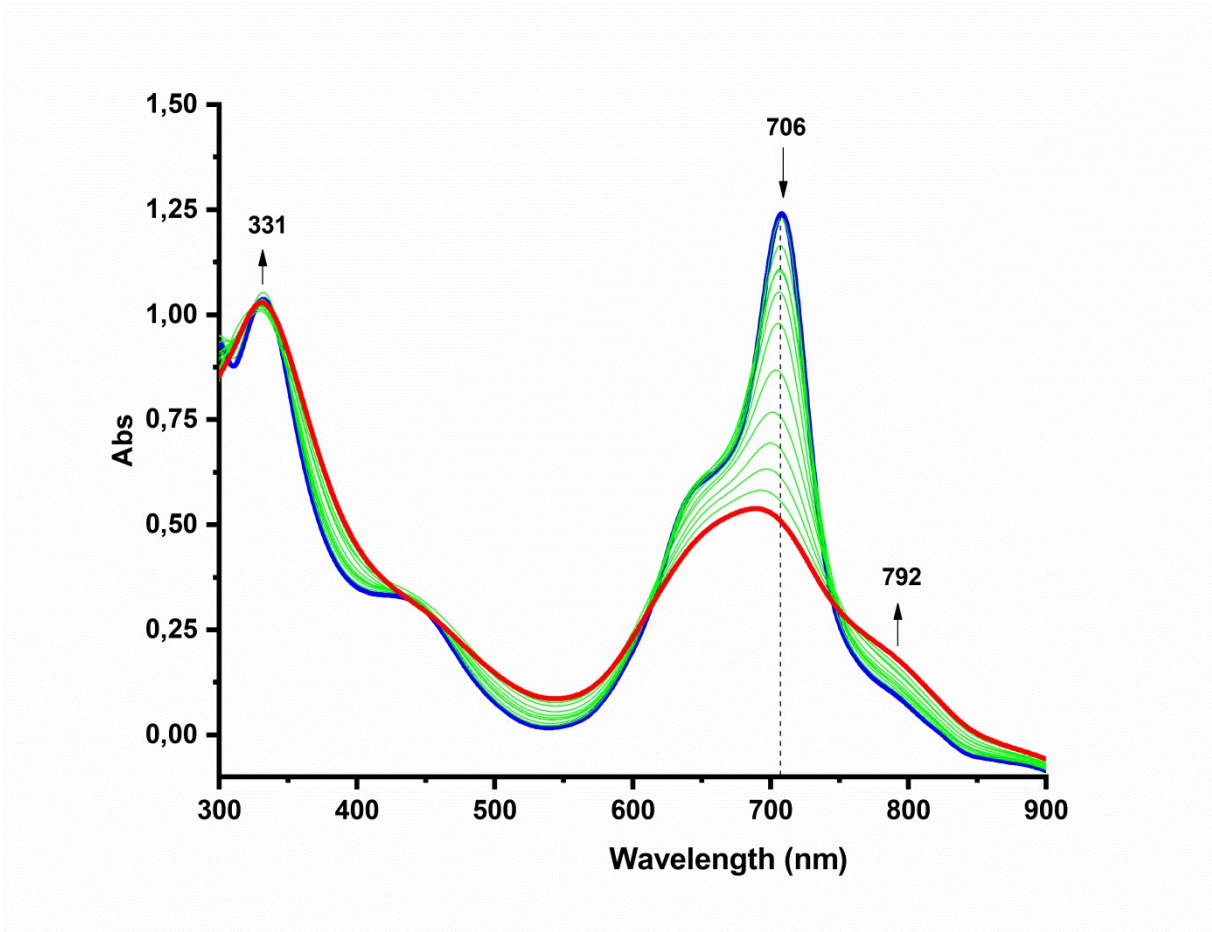

Fig. S6 Electronic spectra of CuPc **(3)** during the titration with Pd(II) ions.

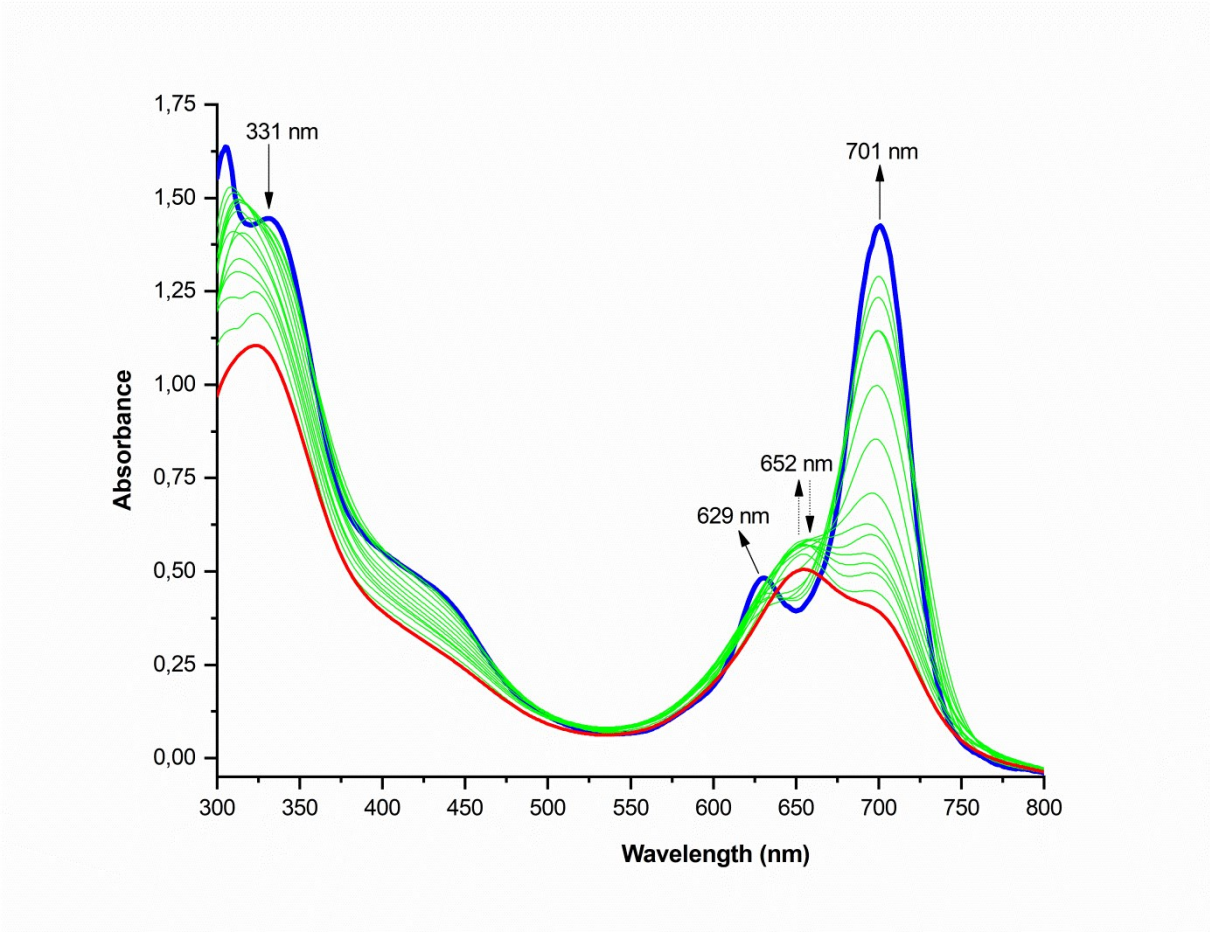

Fig. S7 Electronic spectra of CoPc **(4)** during the titration with Ag(I) ions.

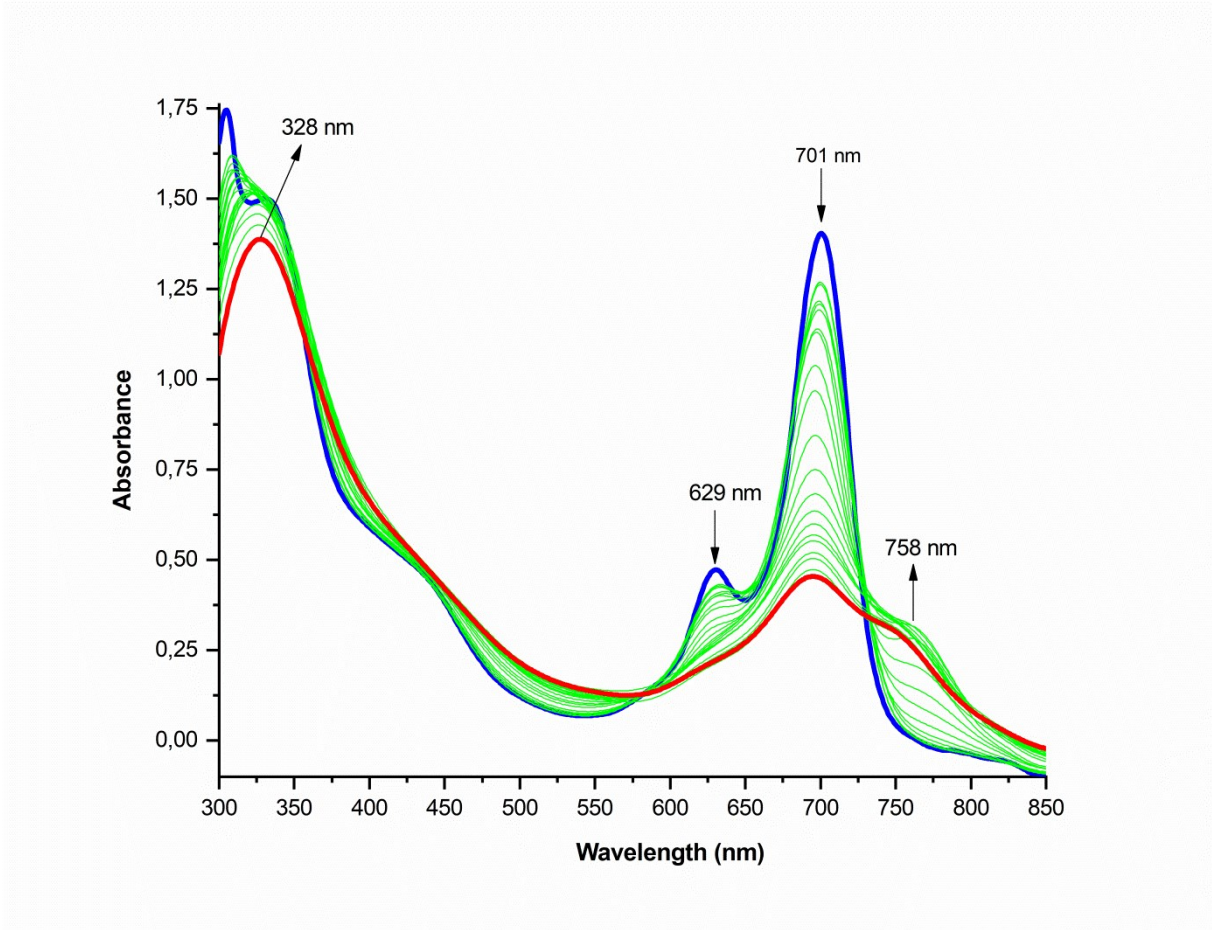

Fig. S8 Electronic spectra of CoPc **(5)** during the titration with Pd(II) ions.

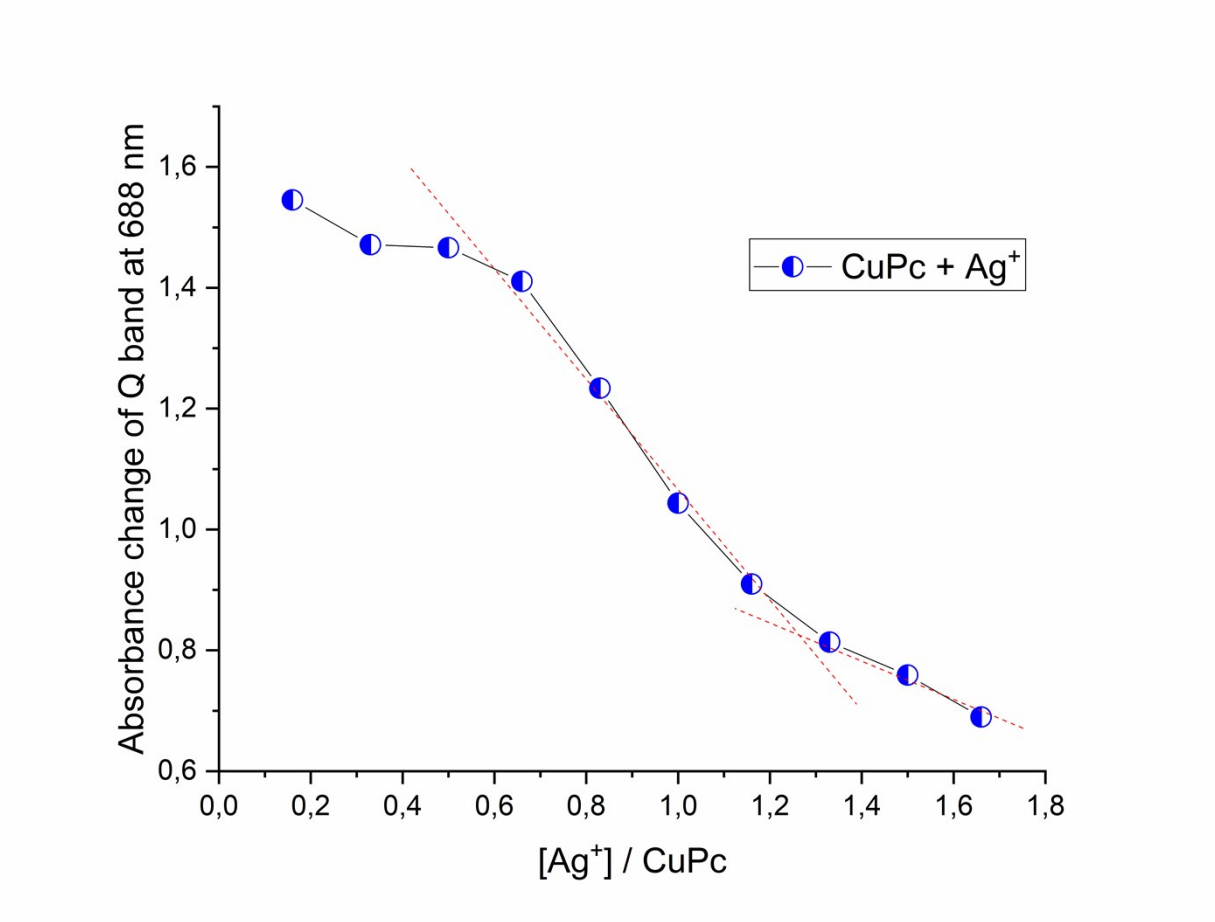

Fig. S9 The plot of the change of Q band versus $[Ag^+]/[CuPc]$.

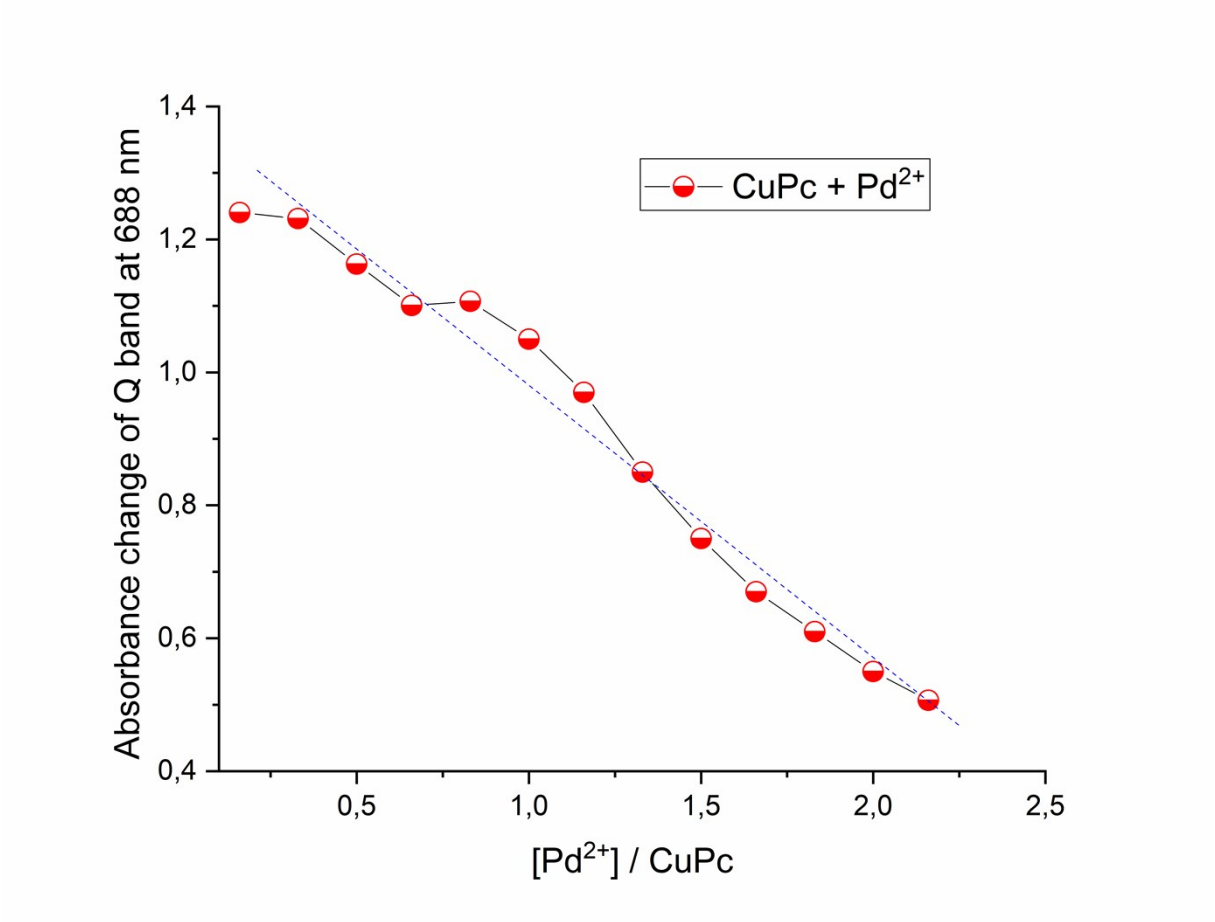

Fig. S10 The plot of the change of Q band versus $[Pd^{2+}]/[CuPc]$.

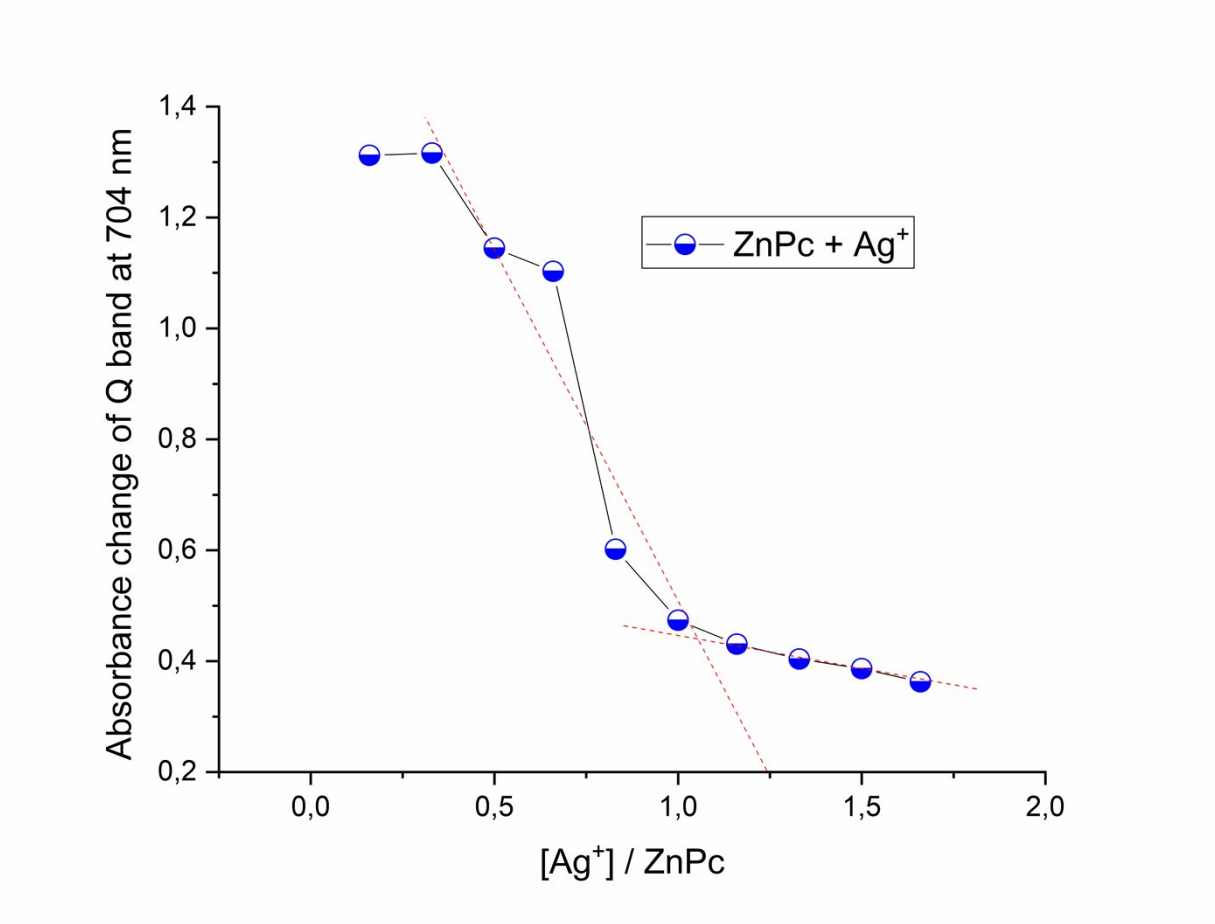

Fig. S11 The plot of the change of Q band versus $[Ag^+]/[ZnPc]$.

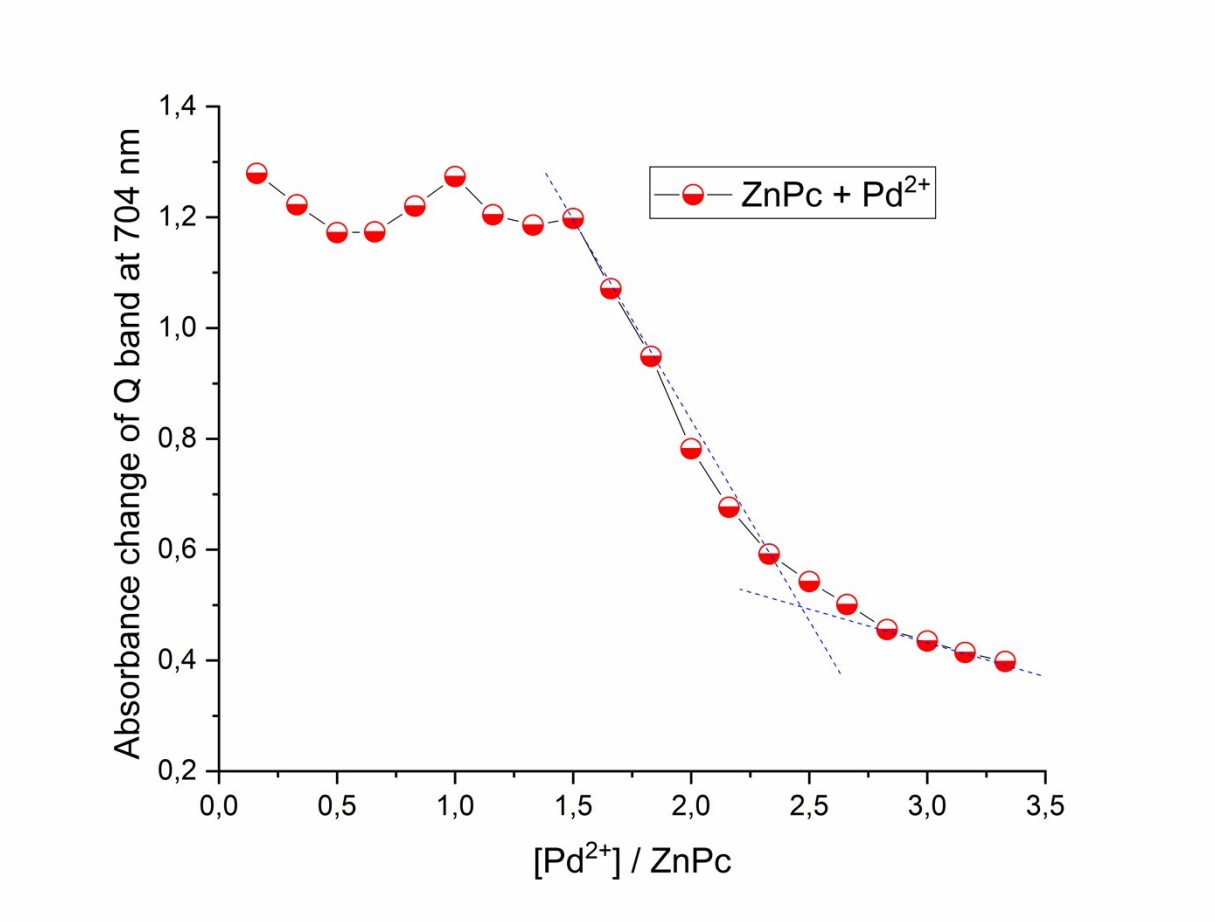

Fig. S12 The plot of the change of Q band versus $[Pd^{2+}]/[ZnPc]$.

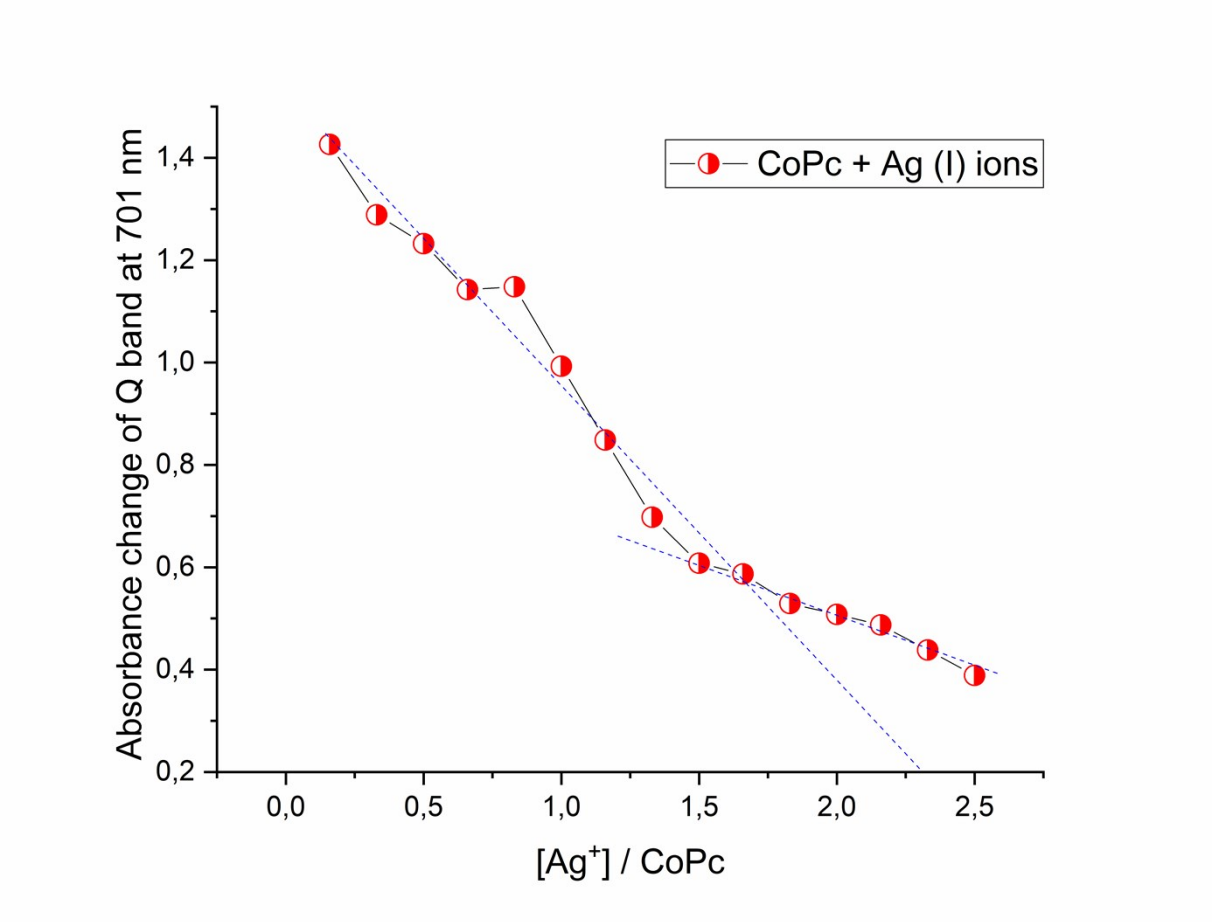

Fig. S13 The plot of the change of Q band versus $[Ag^+]/[CoPc]$.

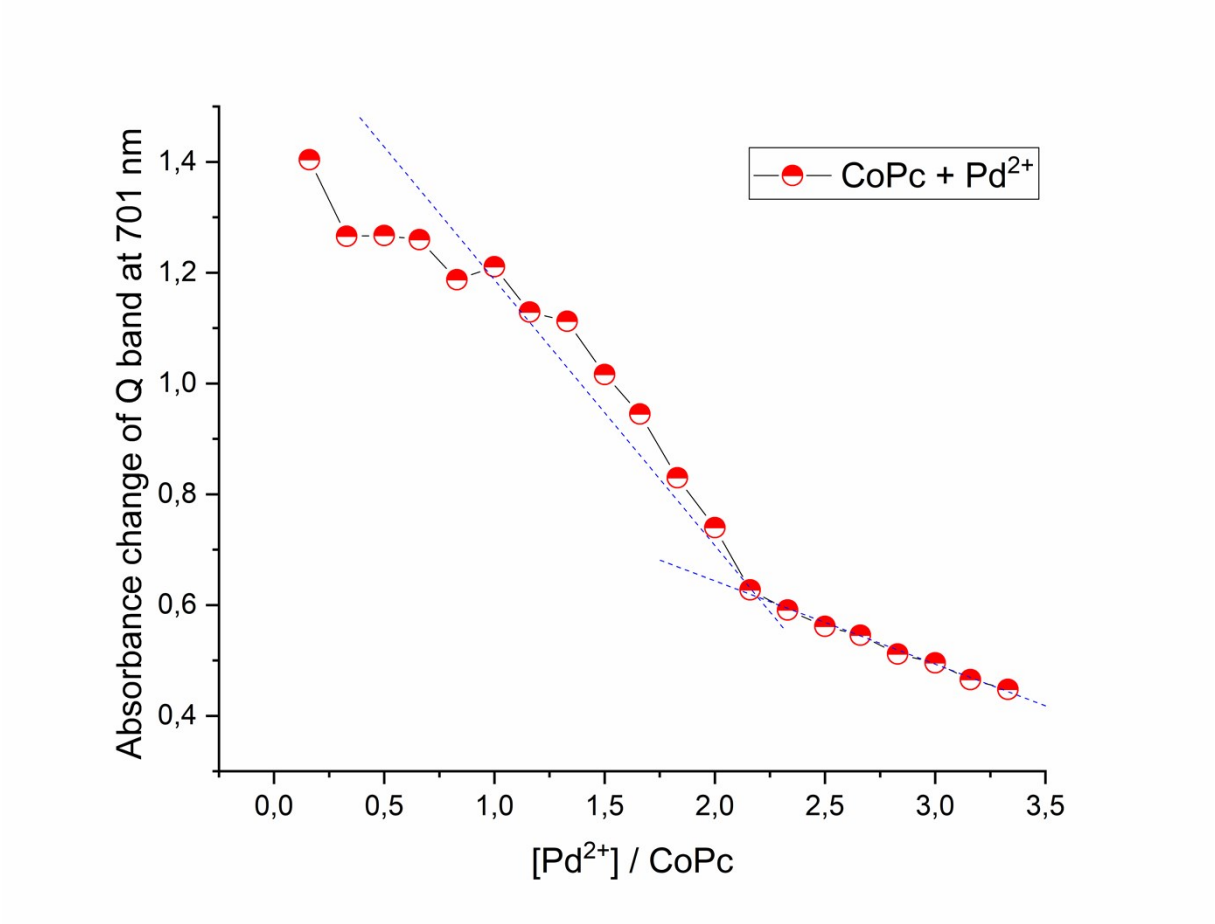

Fig. S14 The plot of the change of Q band versus $[Pd^{2+}]/[CoPc]$.

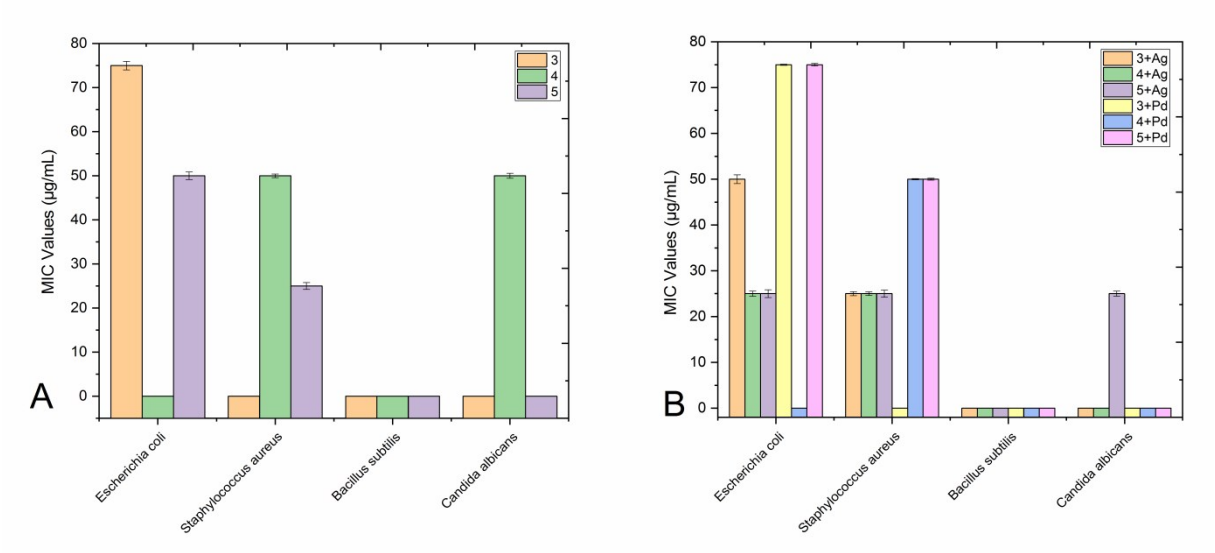

Fig. S15 Minimum Inhibitory Concentration (MIC) results of the synthesized phthalocyanine compounds (A) and their doped Ag(I) and Pd(II) ion forms (B).

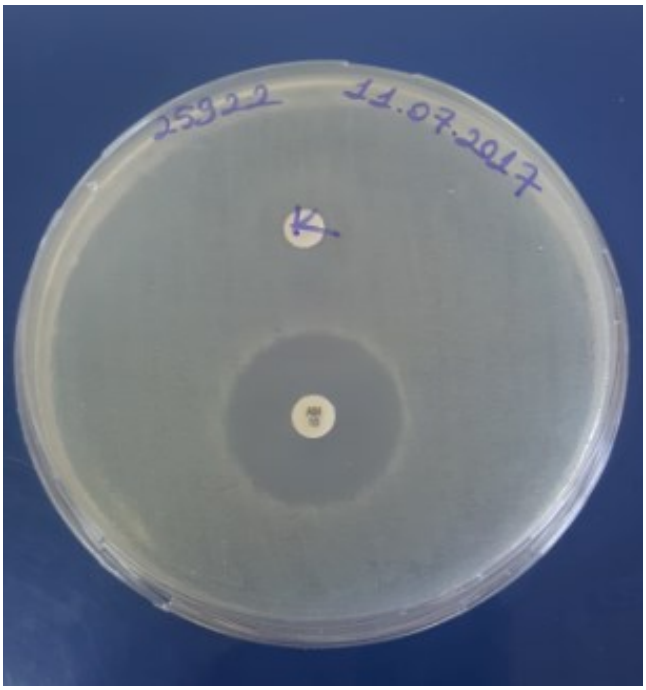

Fig. S16. Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *E.coli*, K: control (DMF), AM10: Ampicillin 10 µg

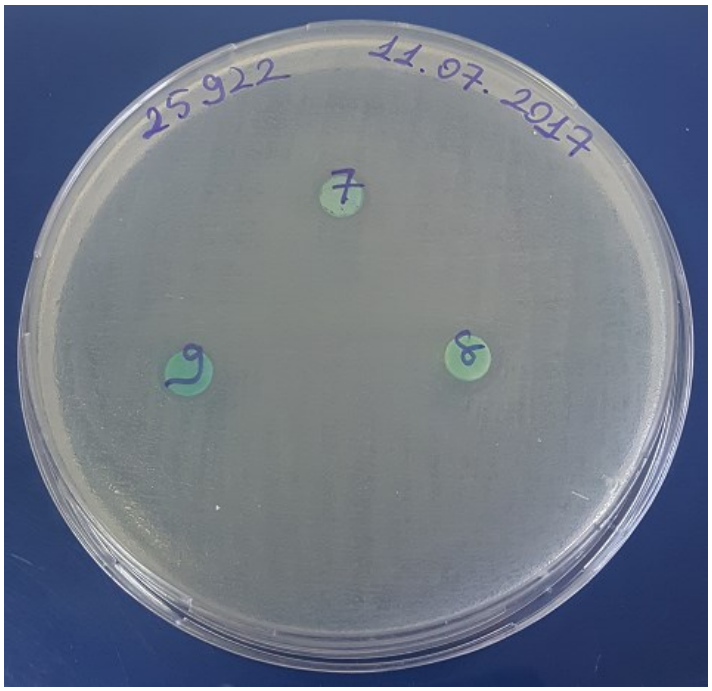

Fig. S17. Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *E. coli* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

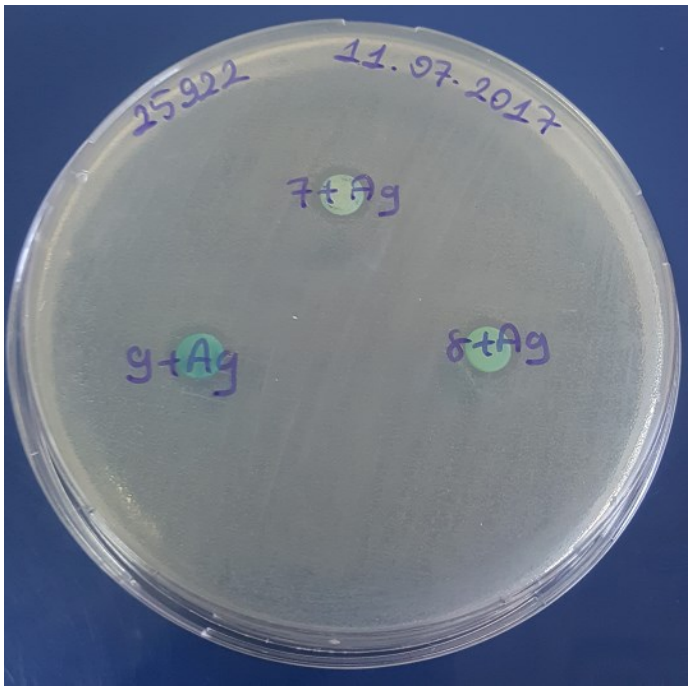

Fig. S18. Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *E. coli* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

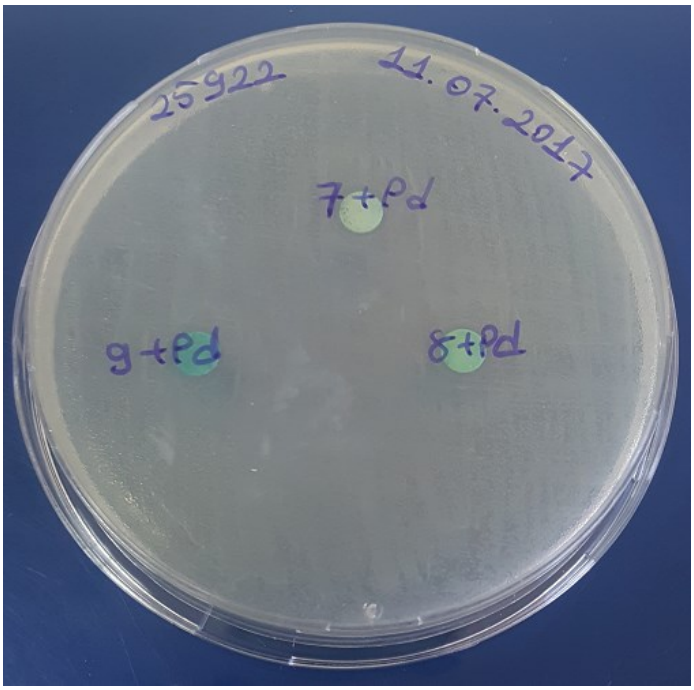

Fig. S19. Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *E. coli* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

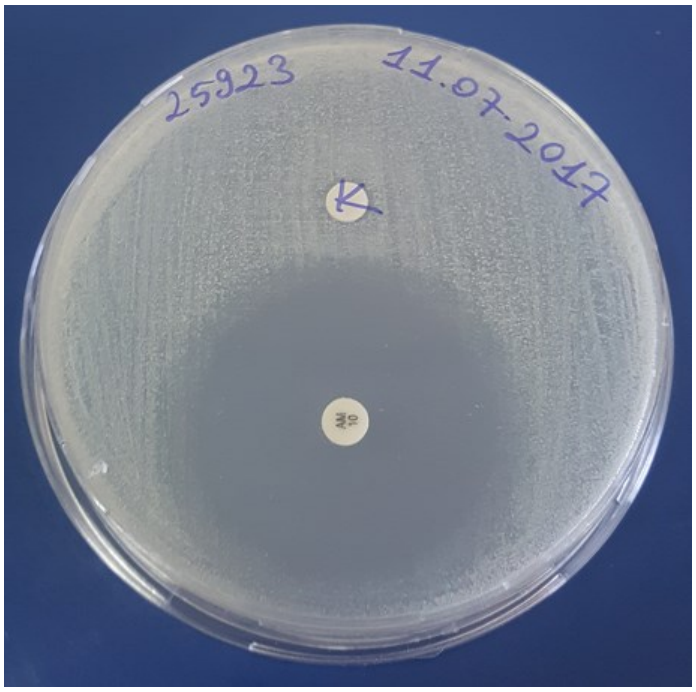

Fig. S20. Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *S. aureus,* K: control (DMF), AM10: Ampicillin 10 µg

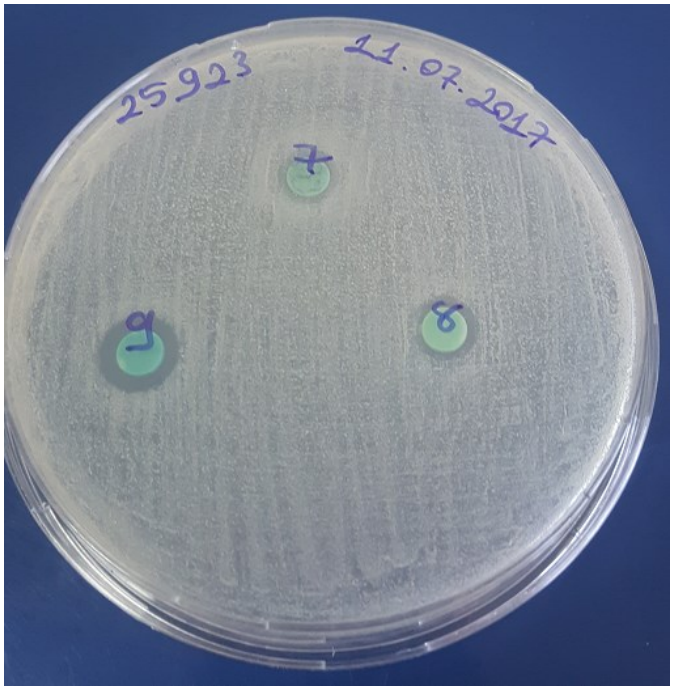

Fig. S21. Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *S. aureus* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

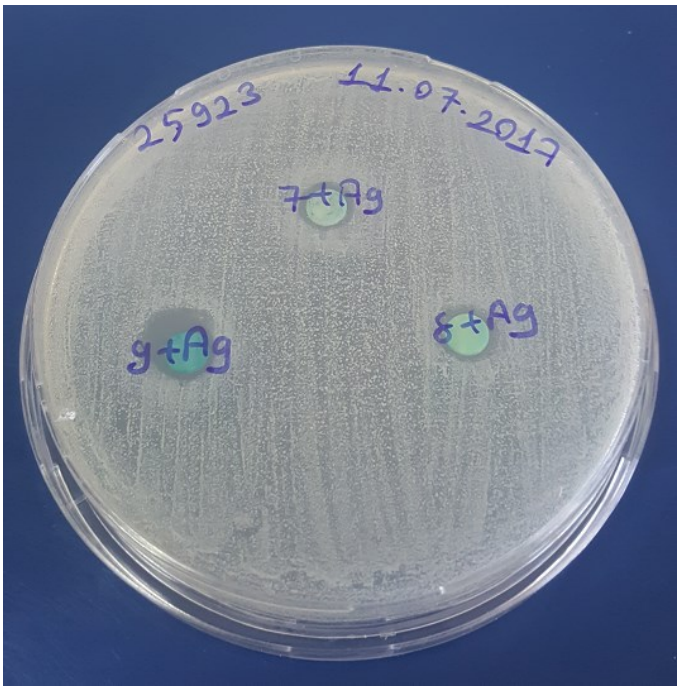

Fig. S22. Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *S. aureus* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

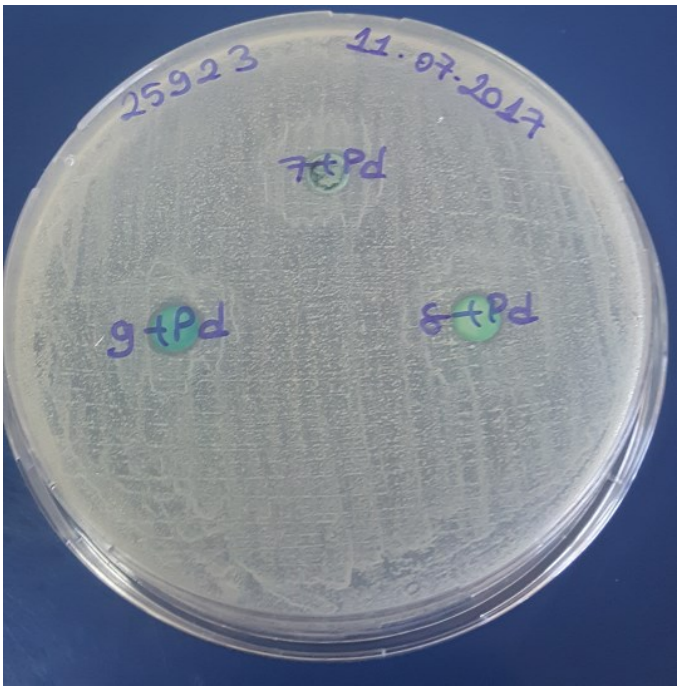

Fig. S23. Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *S. aureus* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

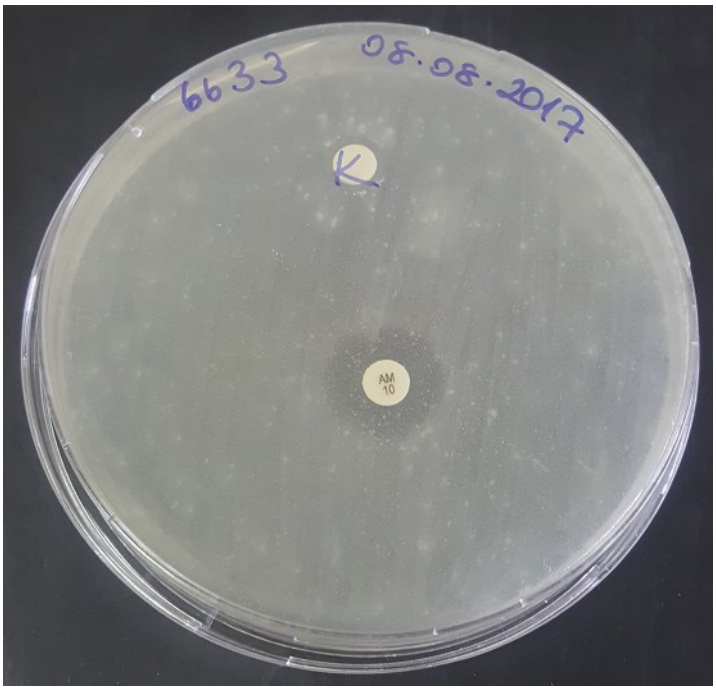

Fig. S24. Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *B. subtilis,* K: control (DMF), AM10: Ampicillin 10 µg

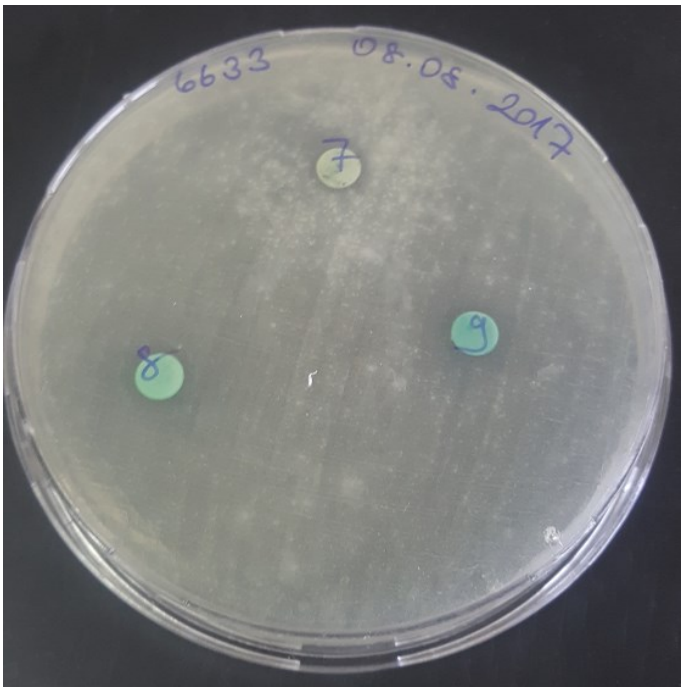

Fig. S25. Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *B. subtilis* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

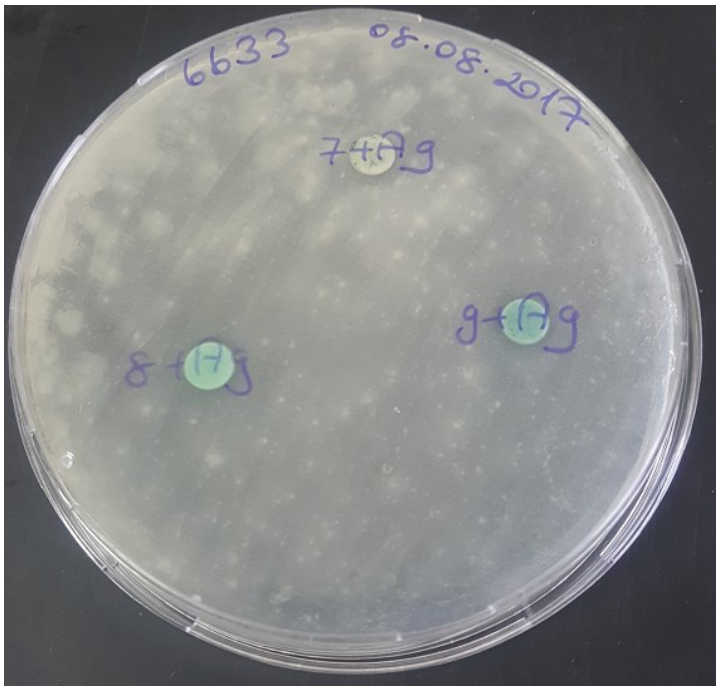

Fig. S26. Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *B. subtilis* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

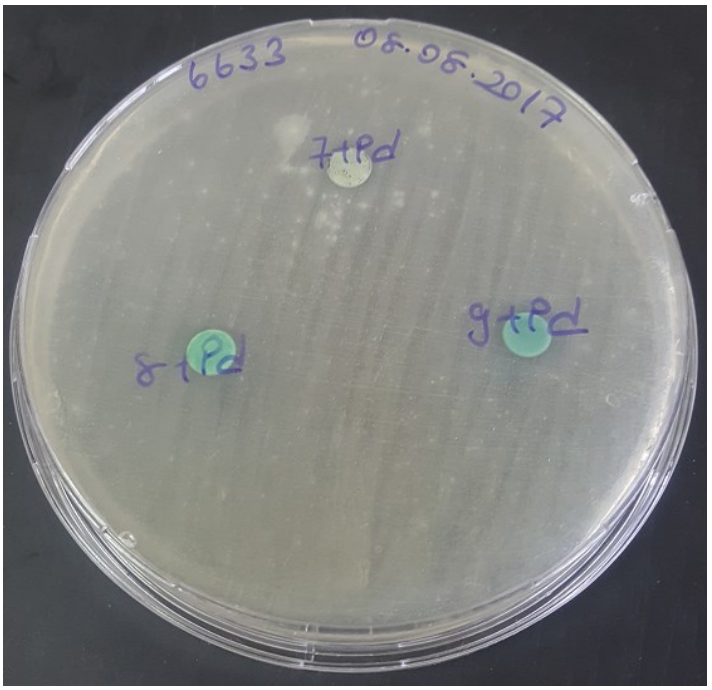

Fig. S27. Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *B. subtilis* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

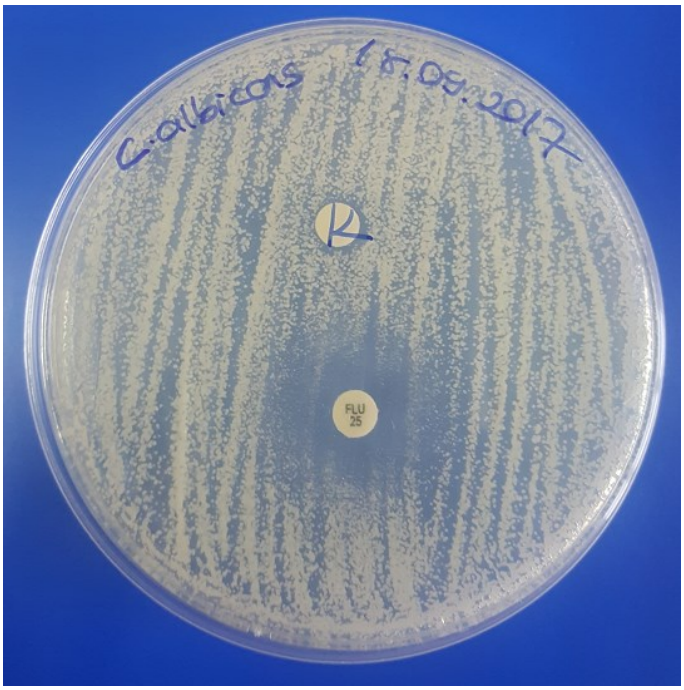

Fig. S28. Inhibition zones formed by DMF (control) impregnated disc and antibiotic standard disc against *C.albicans,* **K**: control (DMF), **FLU25**: Fluconazole 25 µg

Fig. S29. Inhibition zones formed by discs impregnated with compound **3**, **4**, **5** solutions against *C.albicans* (number 7, 8, 9 refer to compound **3**, **4**, **5**, respectively)

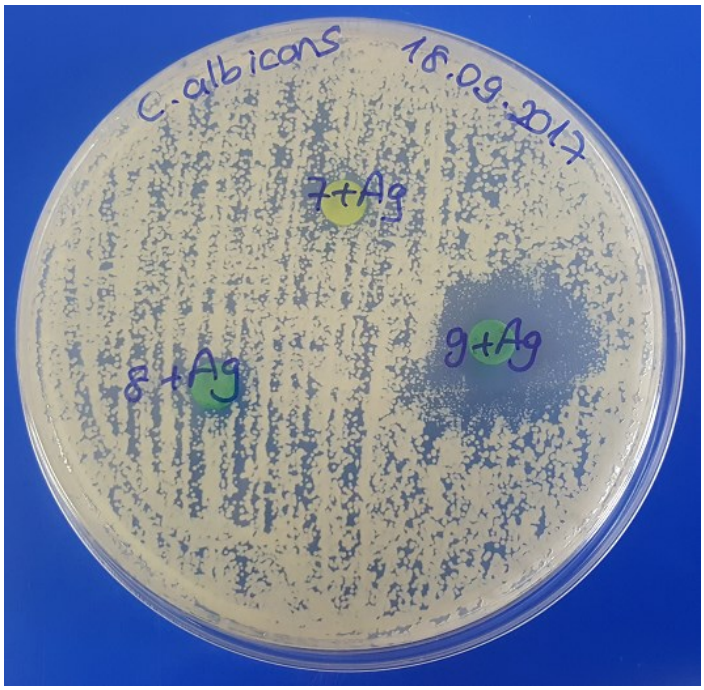

Fig. S30. Inhibition zones formed by discs impregnated with compound **3+Ag**, **4+Ag**, **5+Ag** solutions against *C.albicans* (number 7+Ag, 8+Ag, 9+Ag refer to compound **3+Ag**, **4+Ag**, **5+Ag**, respectively)

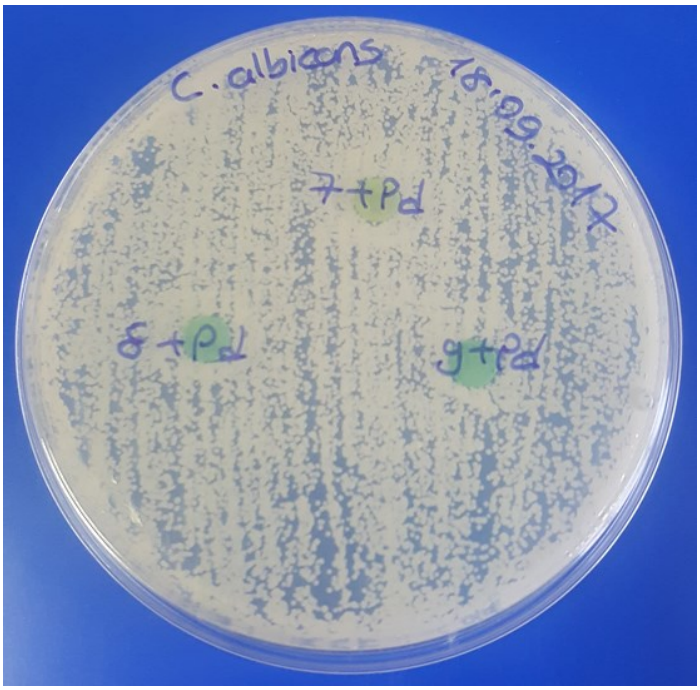

Fig. S31. Inhibition zones formed by discs impregnated with compound **3+Pd**, **4+Pd**, **5+Pd** solutions against *C.albicans* (number 7+Pd, 8+Pd, 9+Pd refer to compound **3+Pd**, **4+Pd**, **5+Pd**, respectively)

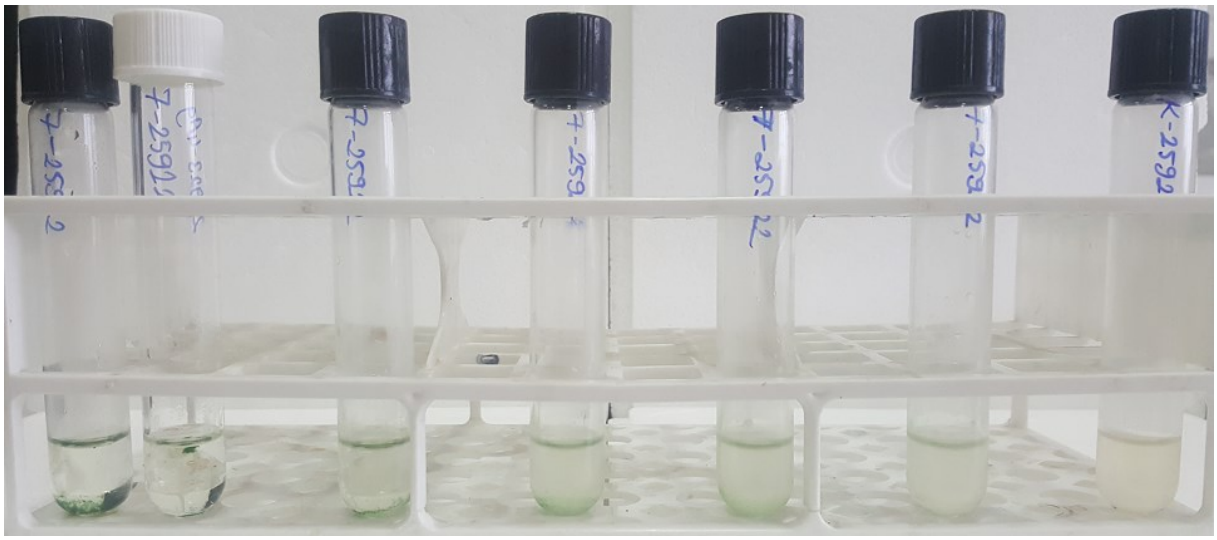

Fig. S32. Compound **3** - *E.coli* MIC test results (concentration of compound **3** in tubes from left to right: 100-75-50-25-12.5-6.25-0 µg/mL; K = control; number 7 refers to compound **3**)

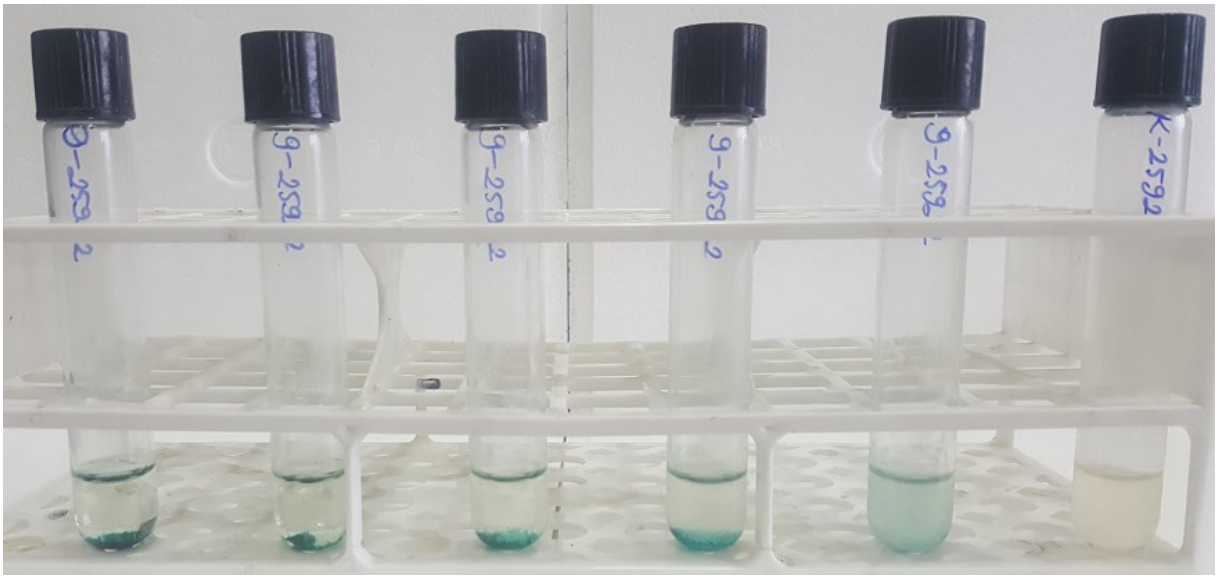

Fig. S33. Compound **5** - *E.coli* MIC test results (concentration of compound **5** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 9 refers to compound **5**)

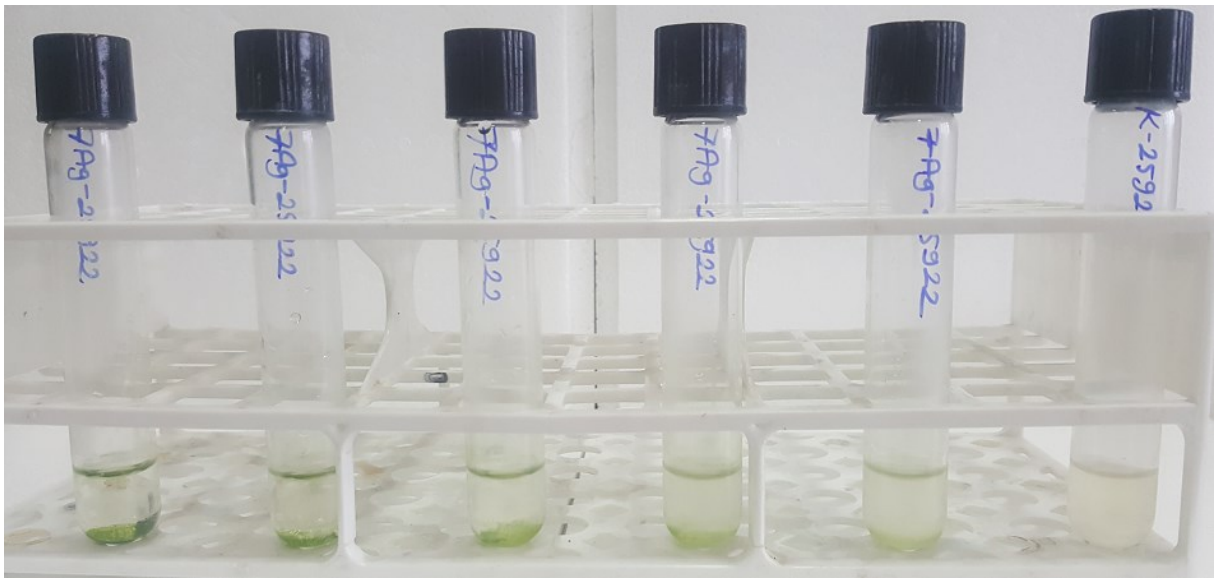

Fig. S34. Compound **3+Ag** - *E.coli* MIC test results (concentration of compound **3+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 7Ag refers to compound **3+Ag**)

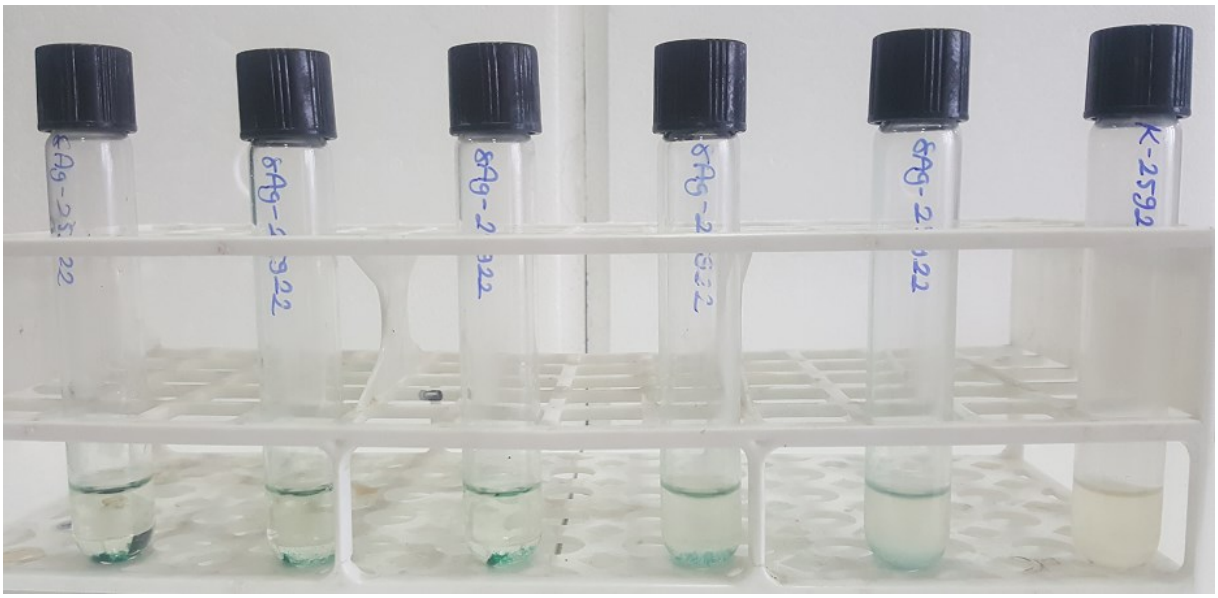

Fig. S35. Compound **4+Ag** - *E.coli* MIC test results (concentration of compound **4+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 8Ag refers to compound **4+Ag**)

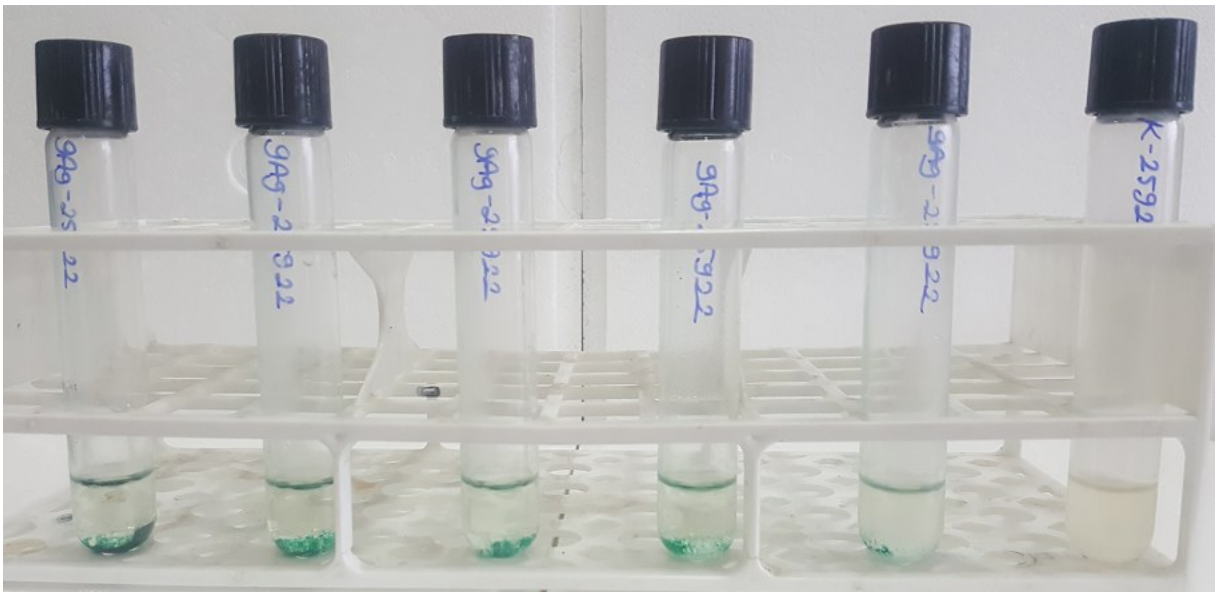

Fig. S36. Compound **5+Ag** - *E.coli* MIC test results (concentration of compound **5+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 9Ag refers to compound **5+Ag**)

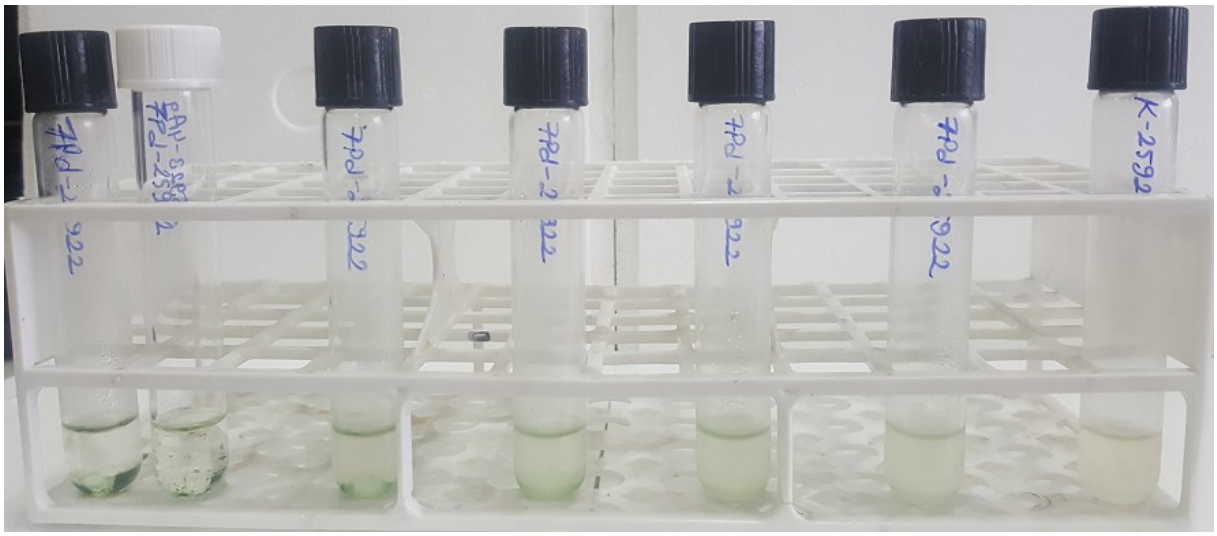

Fig. S37. Compound **3+Pd** - *E.coli* MIC test results (concentration of compound **3+Pd** in tubes from left to right: 100-75-50-25-12.5-6.25-0 µg/mL; K = control; number 7Pd refers to compound **3+Pd**)

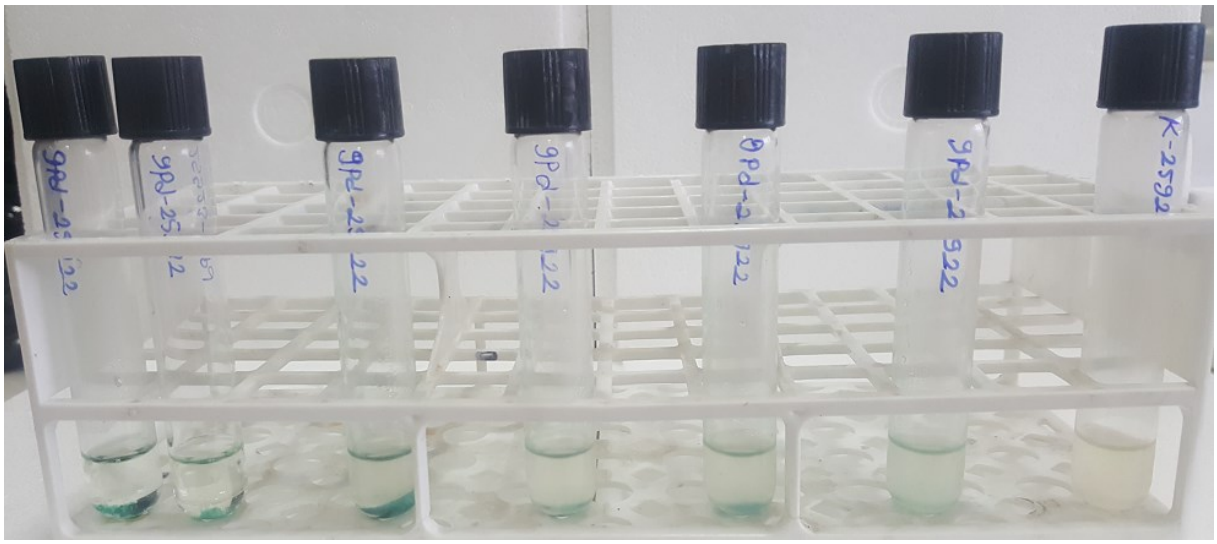

Fig. S38. Compound **5+Pd** - *E.coli* MIC test results (concentration of compound **5+Pd** in tubes from left to right: 100-75-50-25-12.5-6.25-0 µg/mL; K = control; number 9Pd refers to compound **5+Pd**)

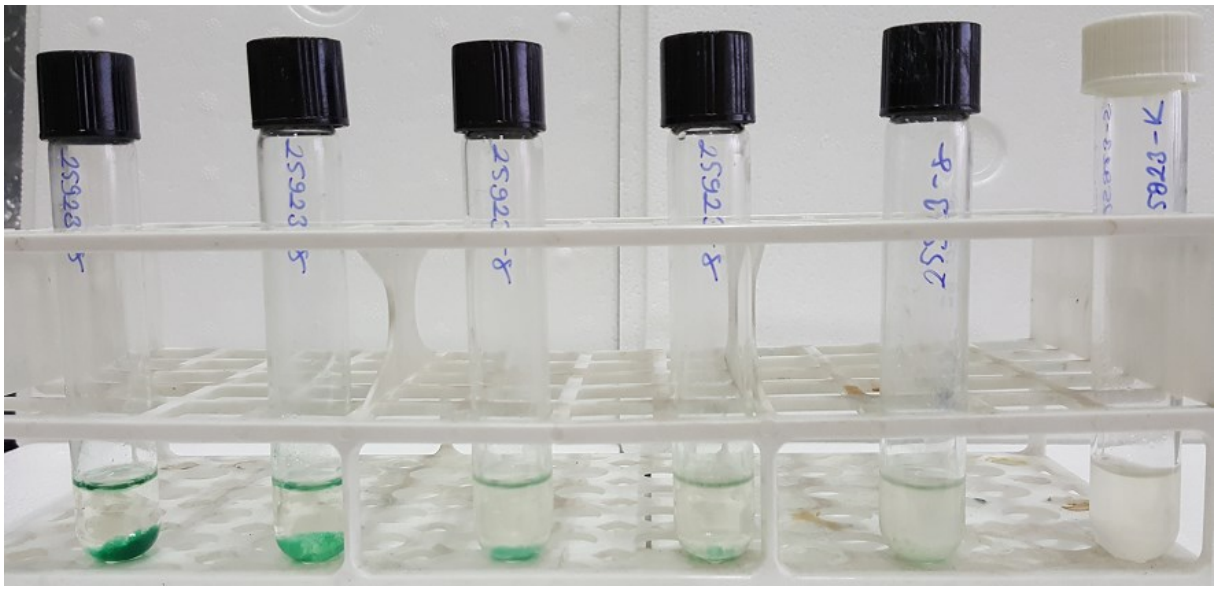

Fig. S39. Compound **4** - *S.aureus* MIC test results (concentration of compound **4** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 8 refers to compound **4**)

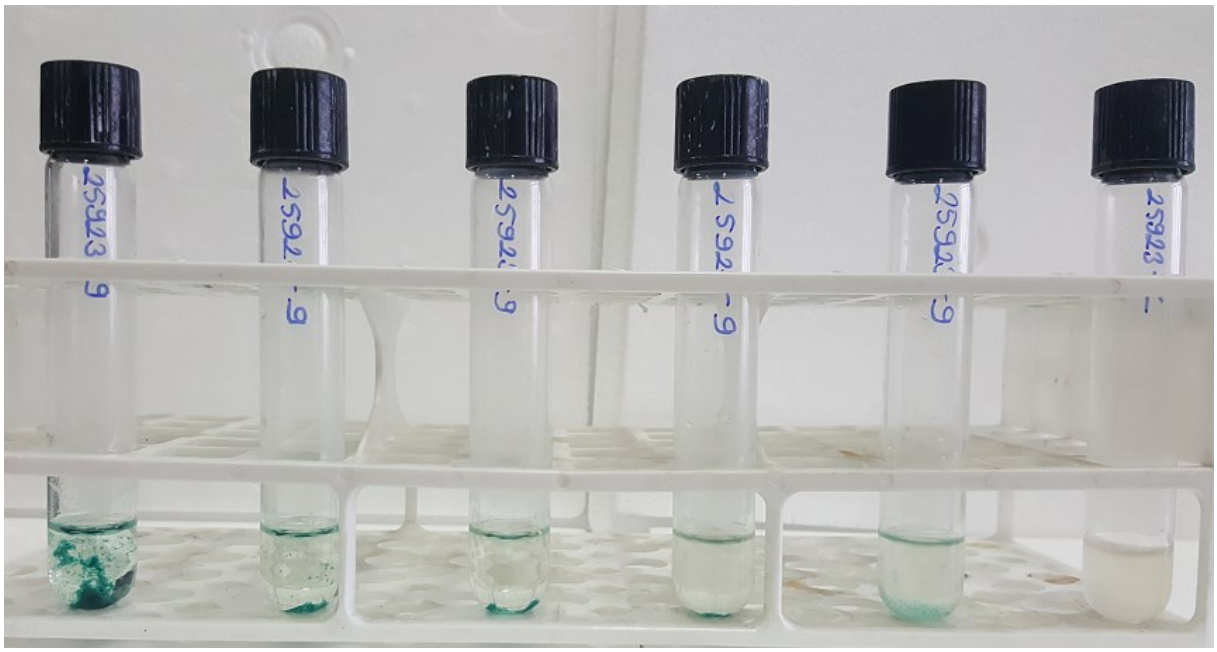

Fig. S40. Compound **5** - *S.aureus* MIC test results (concentration of compound **5** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 9 refers to compound **5**)

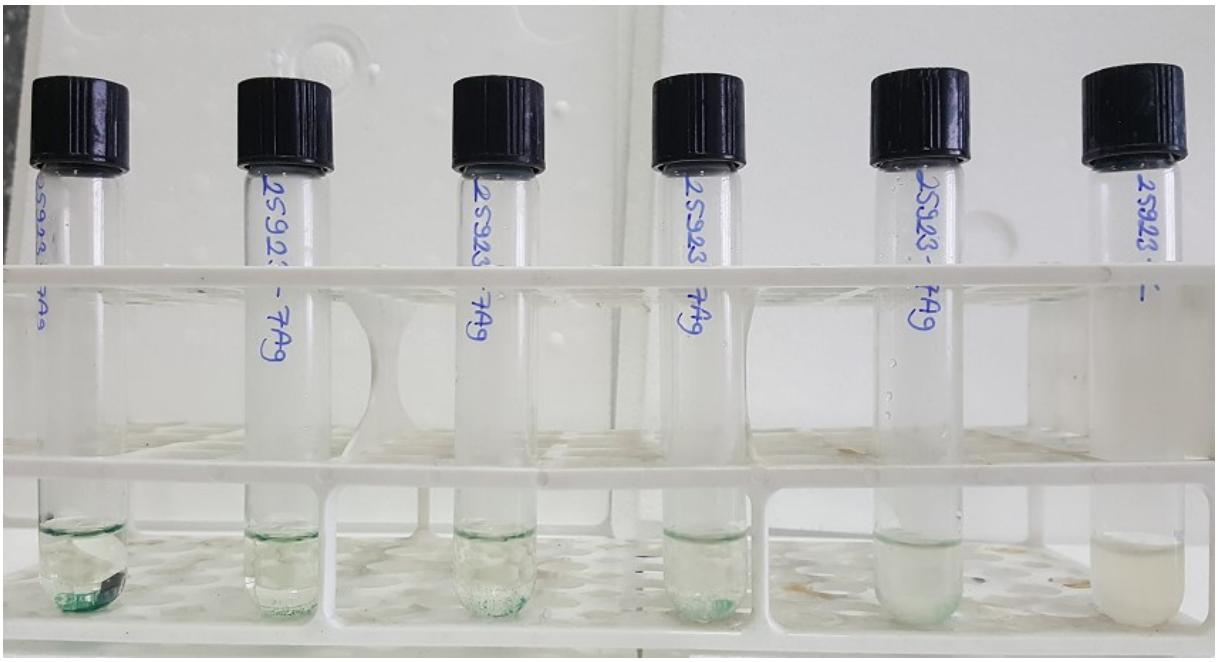

Fig. S41. Compound **3+Ag** - *S.aureus* MIC test results (concentration of compound **3+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 7Ag refers to compound **3+Ag**)

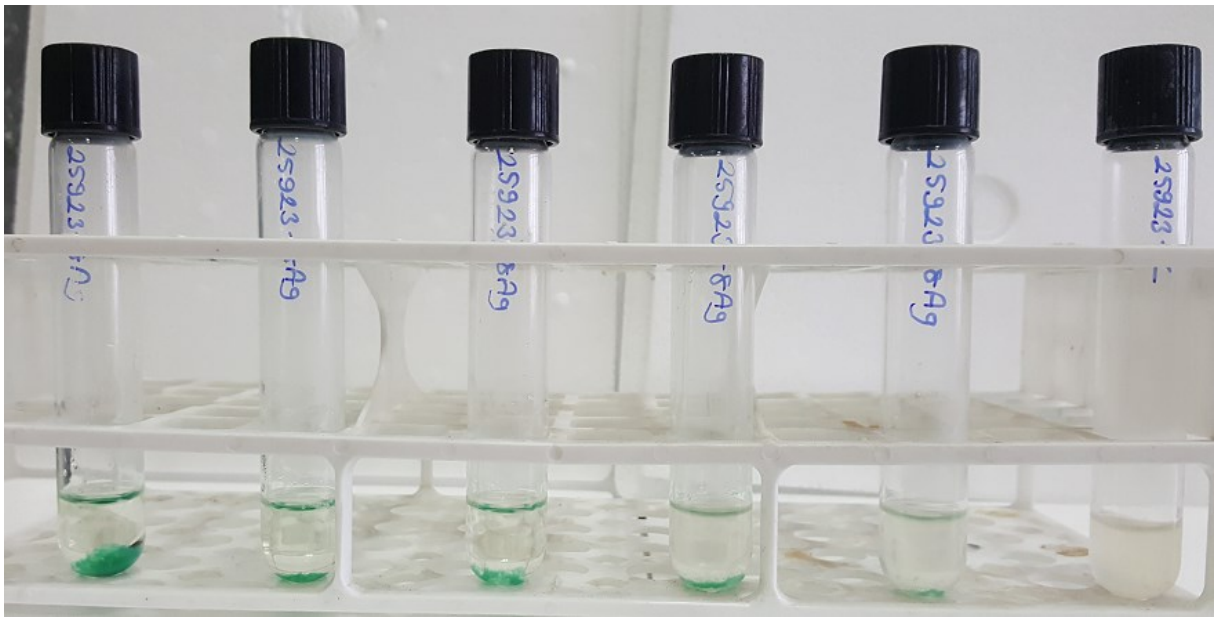

Fig. S42. Compound **4+Ag** - *S.aureus* MIC test results (concentration of compound **4+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 8Ag refers to compound **4+Ag**)

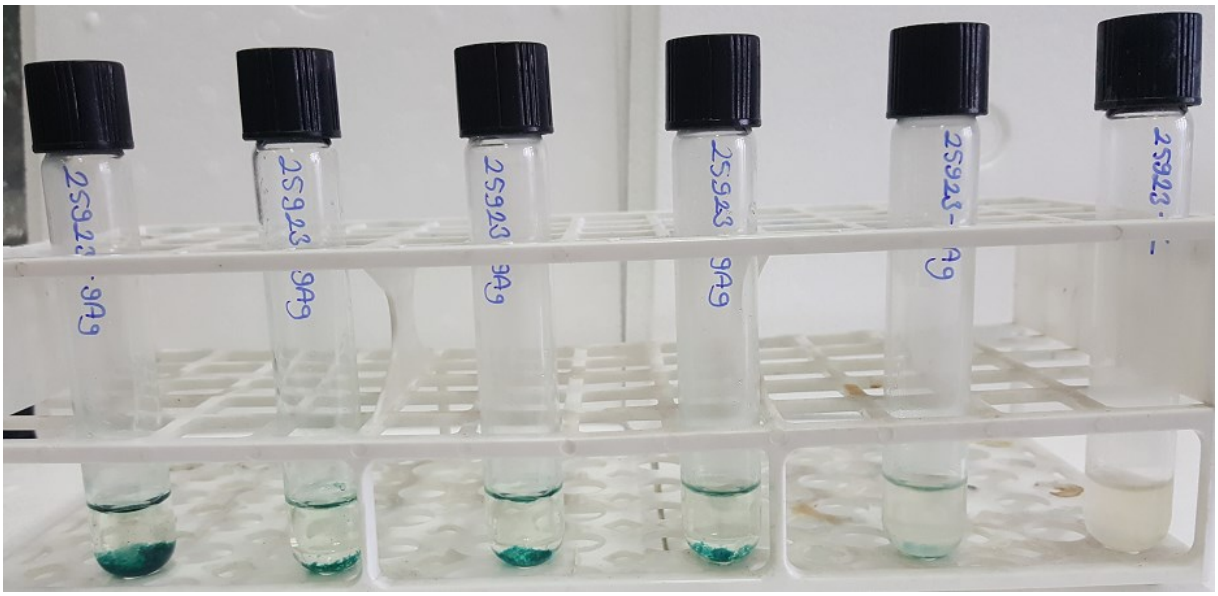

Fig. S43. Compound **5+Ag** - *S.aureus* MIC test results (concentration of compound **5+Ag** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 9Ag refers to compound **5+Ag**)

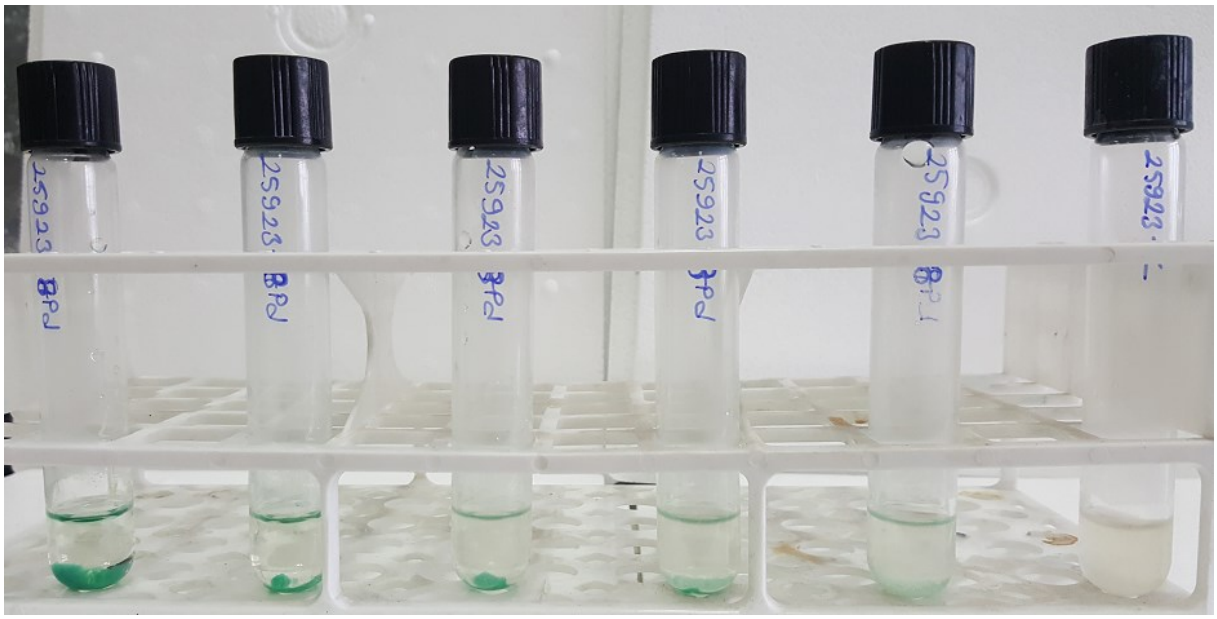

Fig. S44. Compound **4+Pd** - *S.aureus* MIC test results (concentration of compound **4+Pd** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 8Pd refers to compound **4+Pd**)

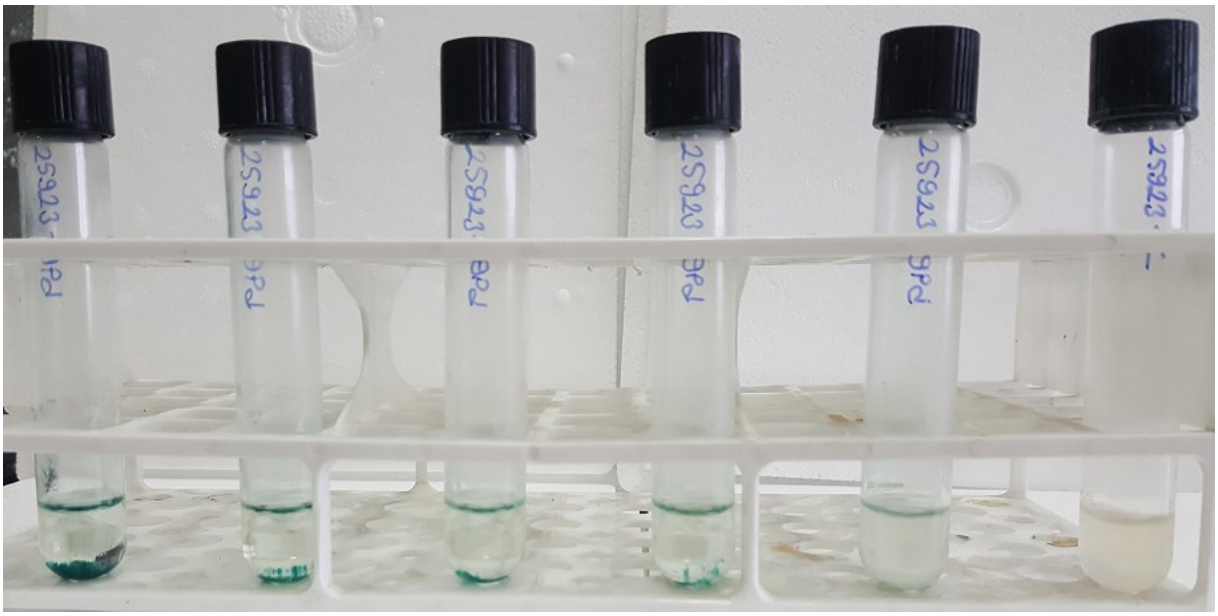

Fig. S45. Compound **5+Pd** - *S.aureus* MIC test results (concentration of compound **5+Pd** in tubes from left to right: 100-50-25-12.5-6.25-0 µg/mL; K = control; number 9Pd refers to compound **5+Pd**)

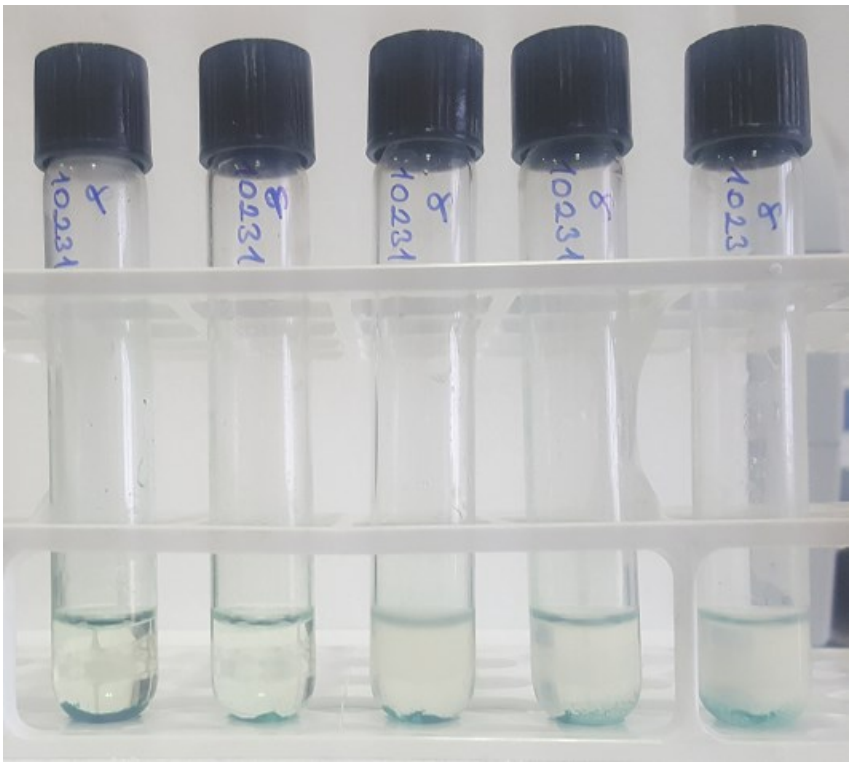

Fig. S46. Compound **4** - *C.albicans* MIC test results (concentration of compound **4** in tubes from left to right: 100-50-25-12.5-6.25 µg/mL; number 8 refers to compound **4**)

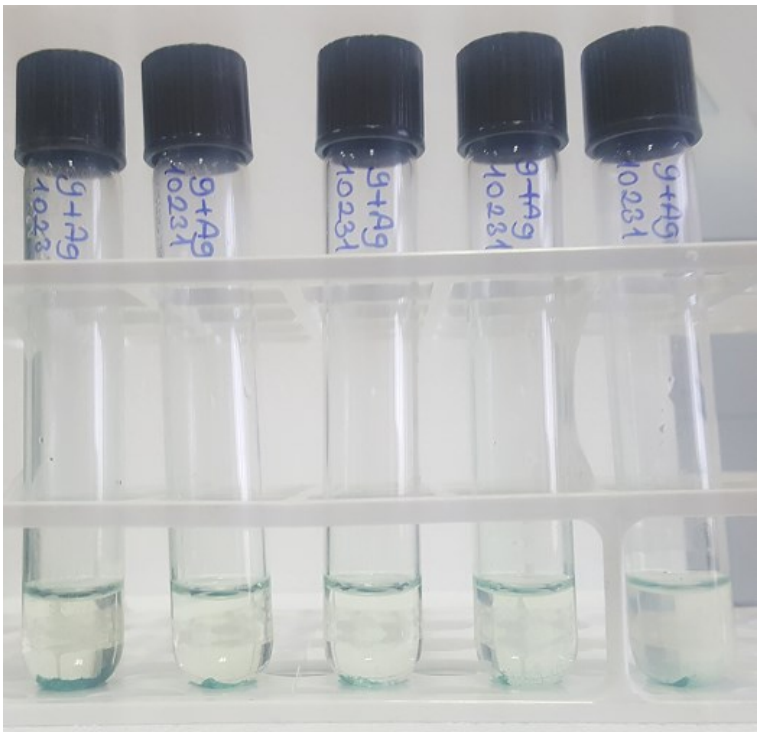

Fig. S47. Compound **5+Ag** - *C.albicans* MIC test results (concentration of compound **5+Ag** in tubes from left to right: 100-50-25-12.5-6.25 μg/mL; number 9+Ag refers to compound **5+Ag**)

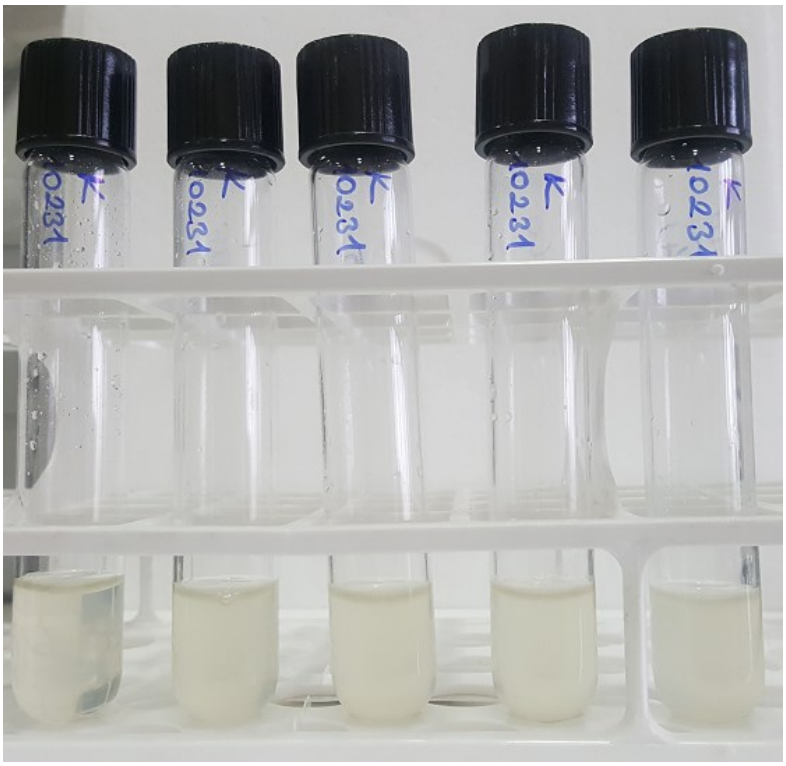

Fig. S48. *C.albicans* MIC test results of controls (DMF amount in tubes from left to right: adjusted to match the solvent amounts of phthalocyanine compounds at a concentration of 100-50-25-12.5-6.25 µg/mL)

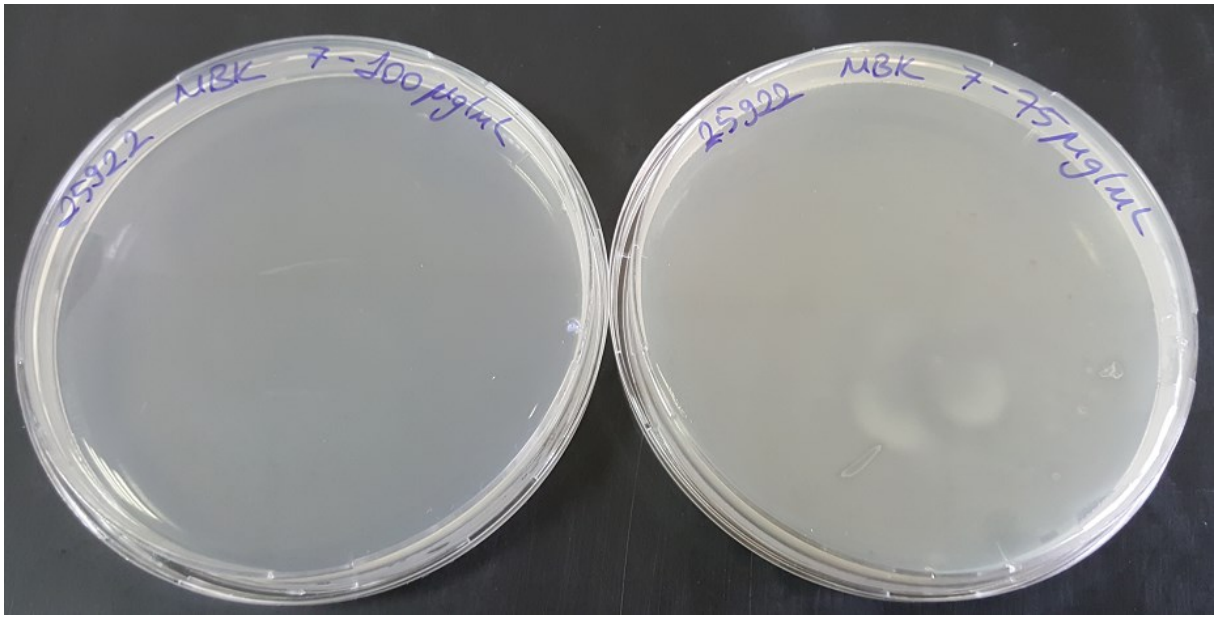

Fig. S49. Compound **3** - *E.coli* MBC test results (number 7 refers to compound **3)**

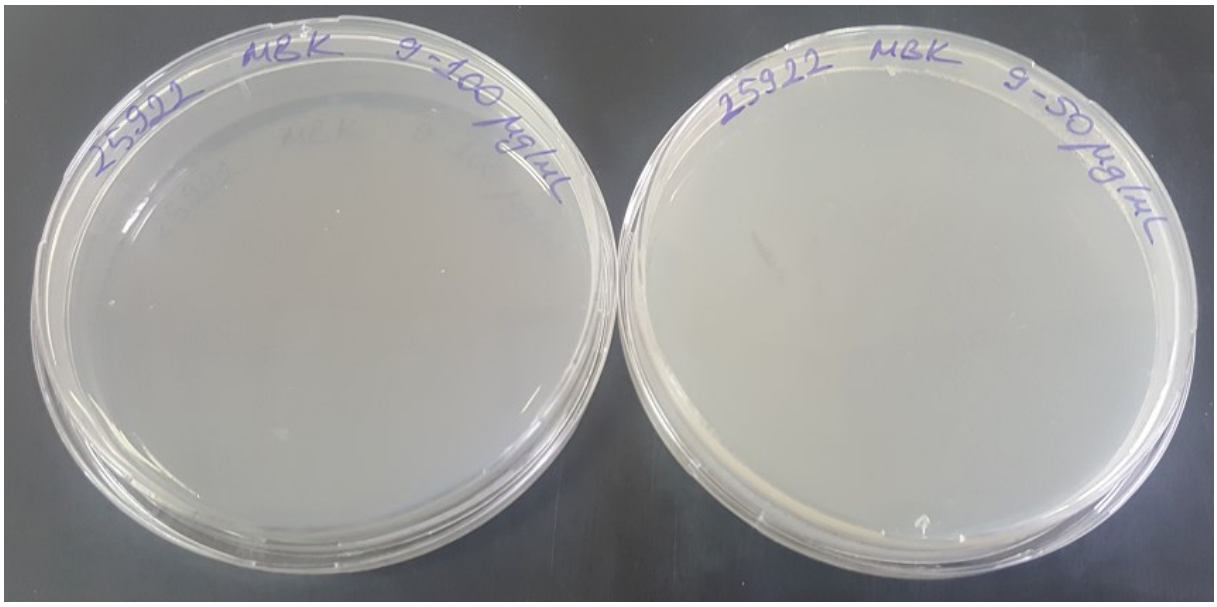

Fig. S50. Compound **5** - *E.coli* MBC test results (number 9 refers to compound **5)**

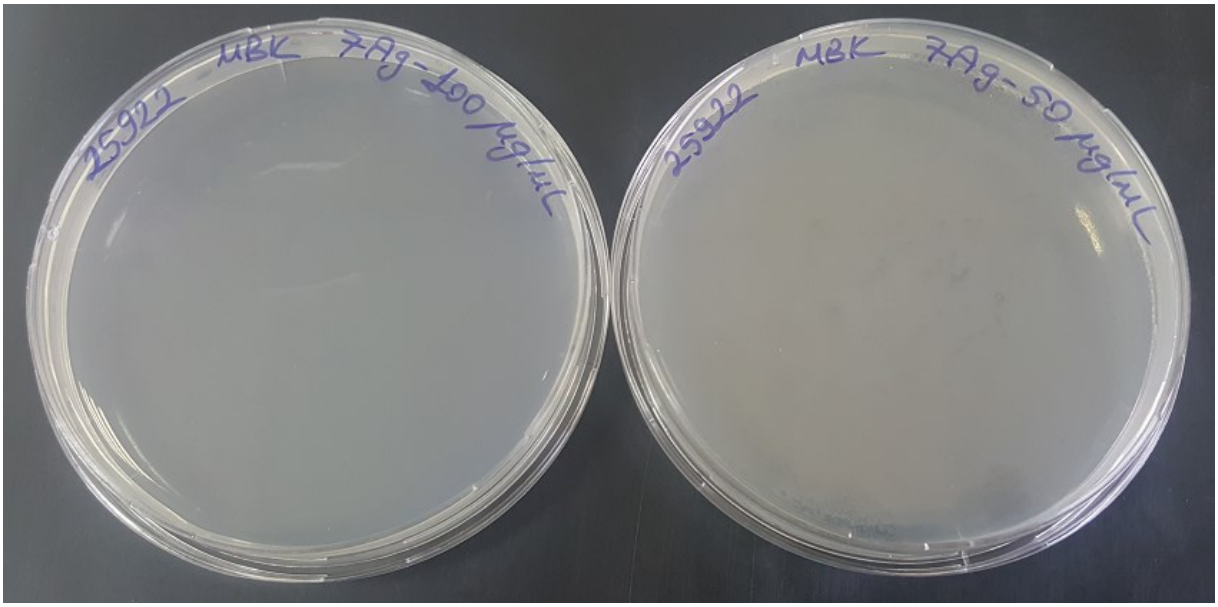

Fig. S51. Compound **3+Ag** - *E.coli* MBC test results (number 7Ag refers to compound **3+Ag)**

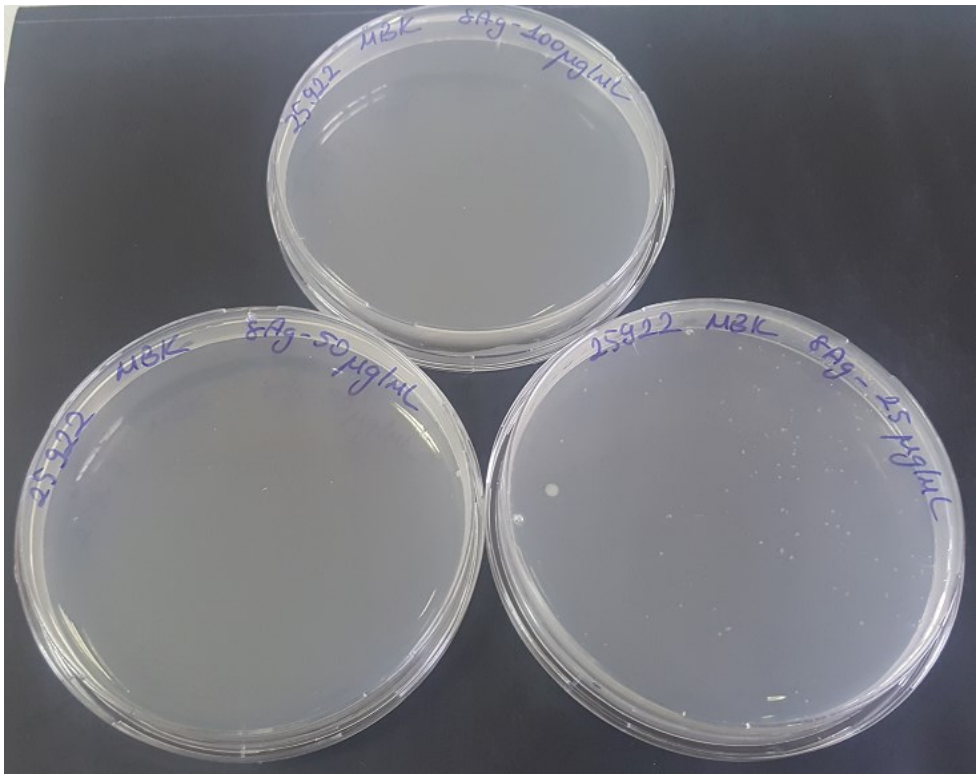

Fig. S52. Compound **4+Ag** - *E.coli* MBC test results (number 8Ag refers to compound **4+Ag)**

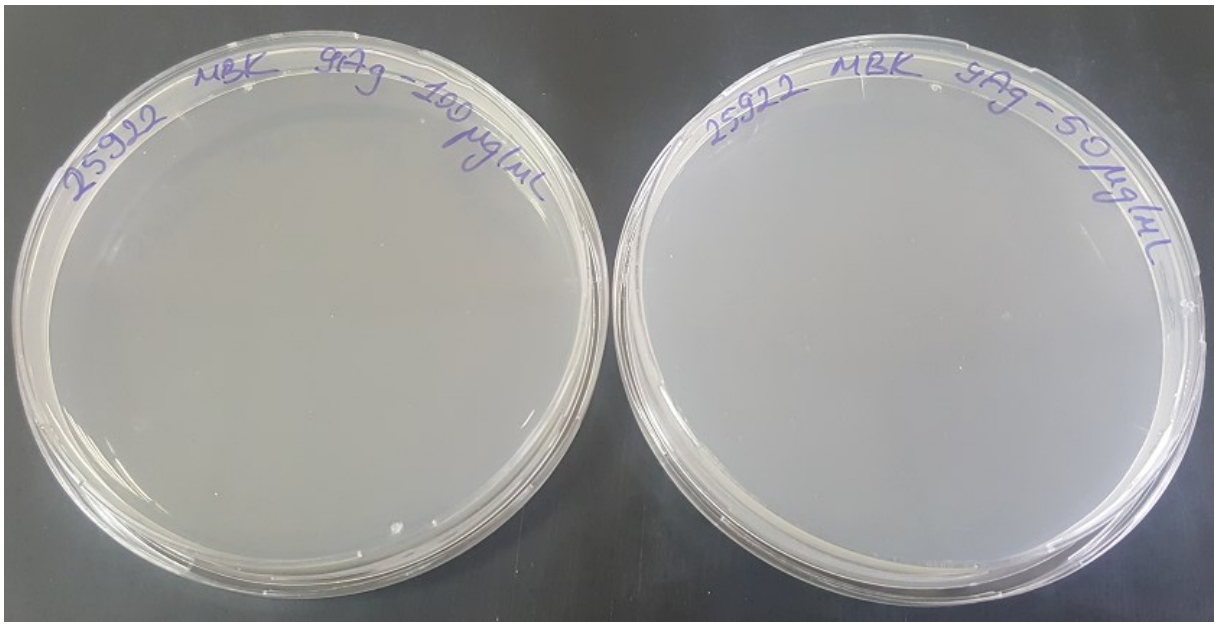

Fig. S53. Compound **5+Ag** - *E.coli* MBC test results (number 9Ag refers to compound **5+Ag)**

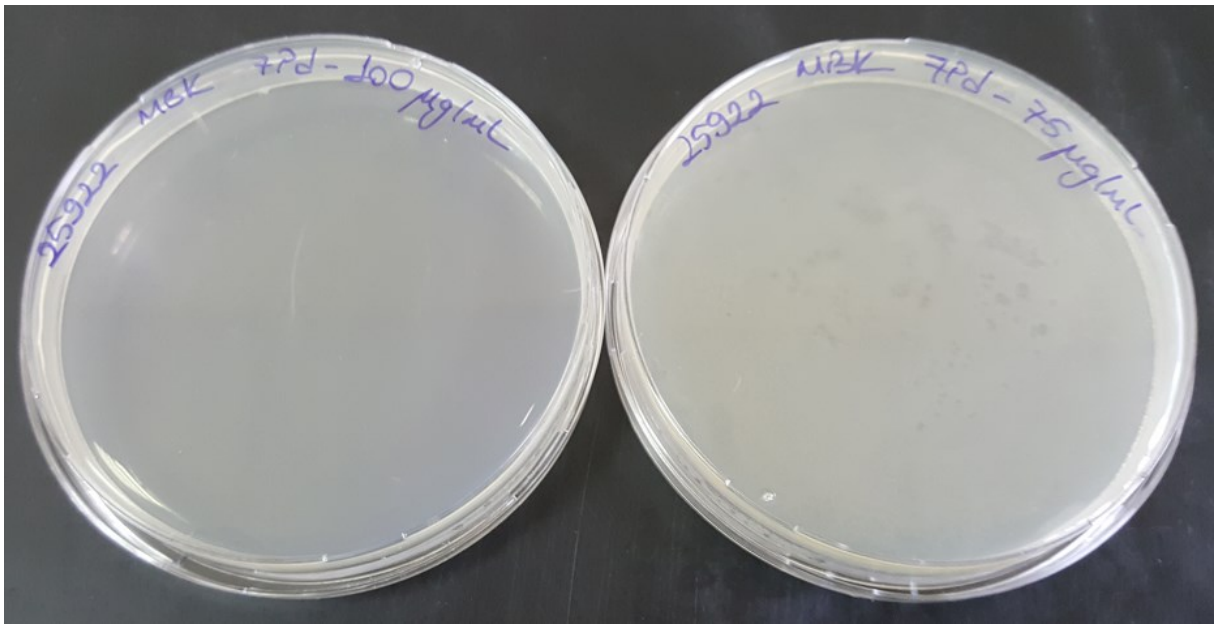

Fig. S54. Compound **3+Pd** - *E.coli* MBC test results (number 7Pd refers to compound **3+Pd)**

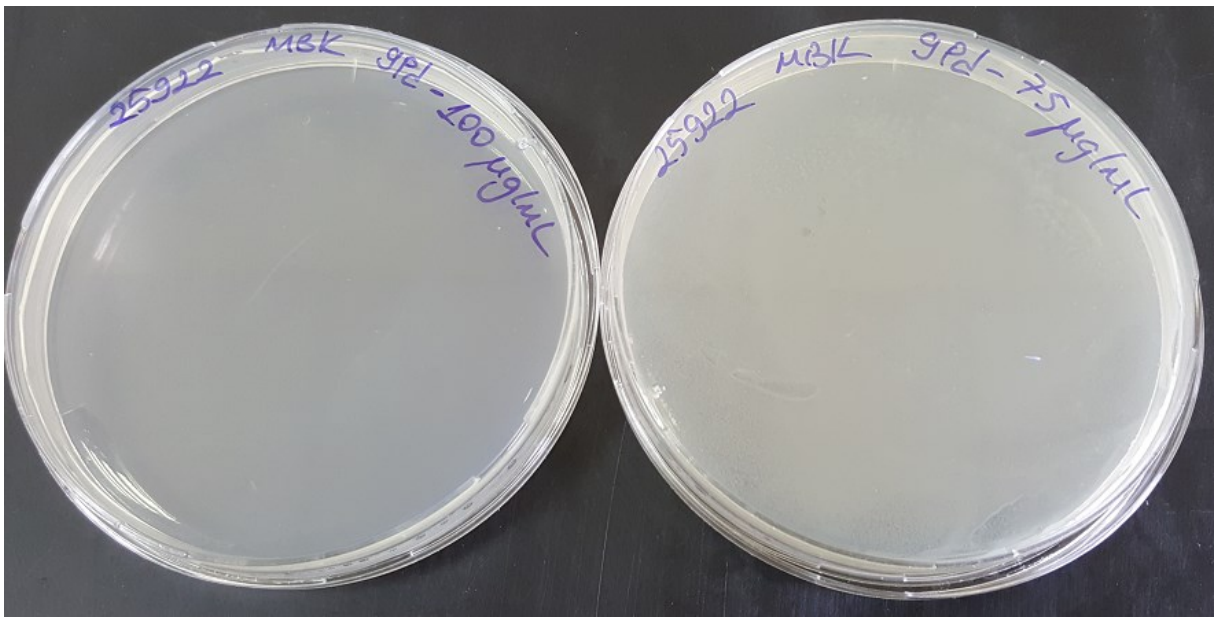

Fig. S55. Compound **5+Pd** - *E.coli* MBC test results (number 9Pd refers to compound **5+Pd)**

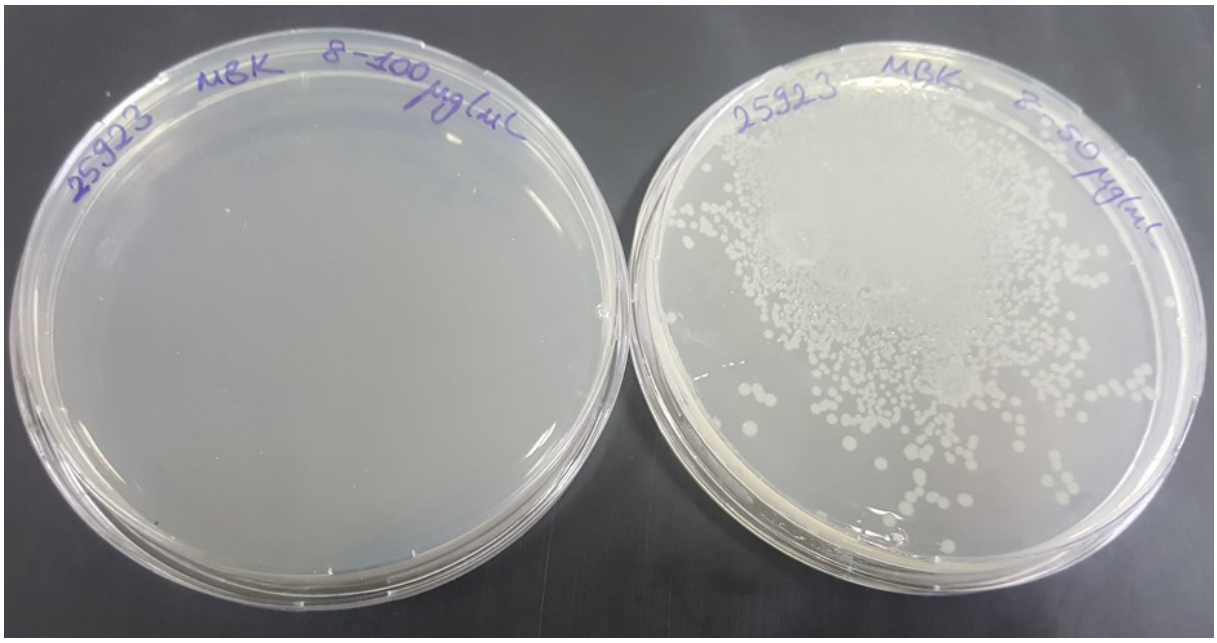

Fig. S56. Compound **4** *S.aureus* MBC test results (number 8 refers to compound **4)**

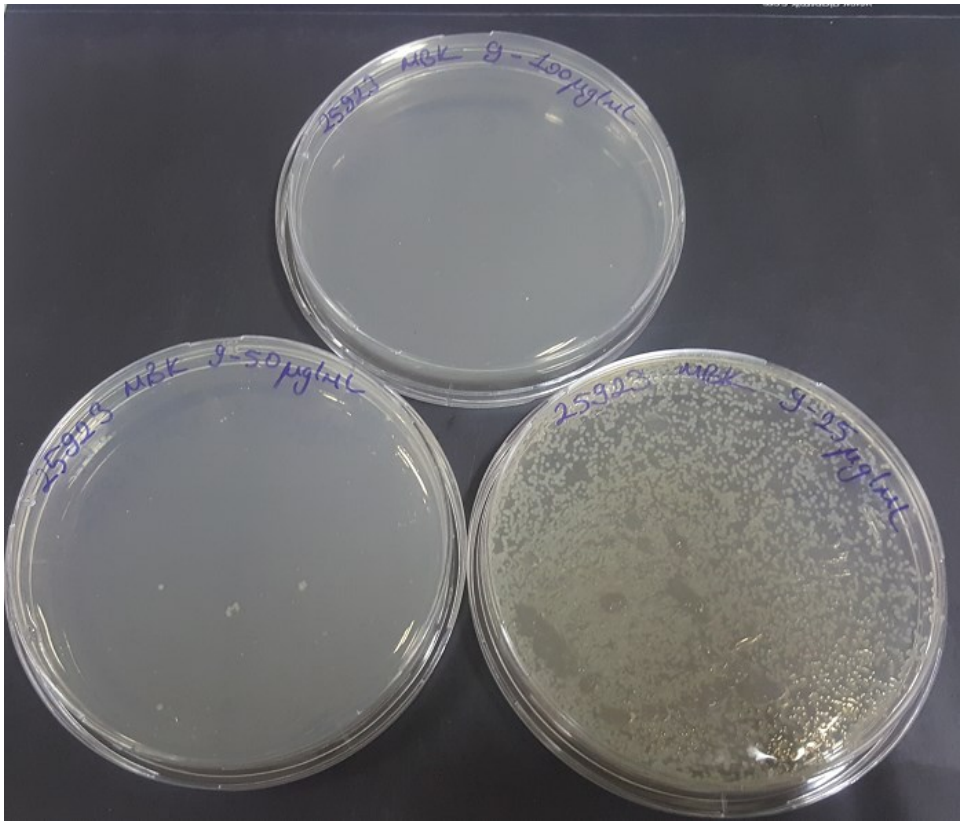

Fig. S57. Compound **5** *S.aureus* MBC test results (number 9 refers to compound **5)**

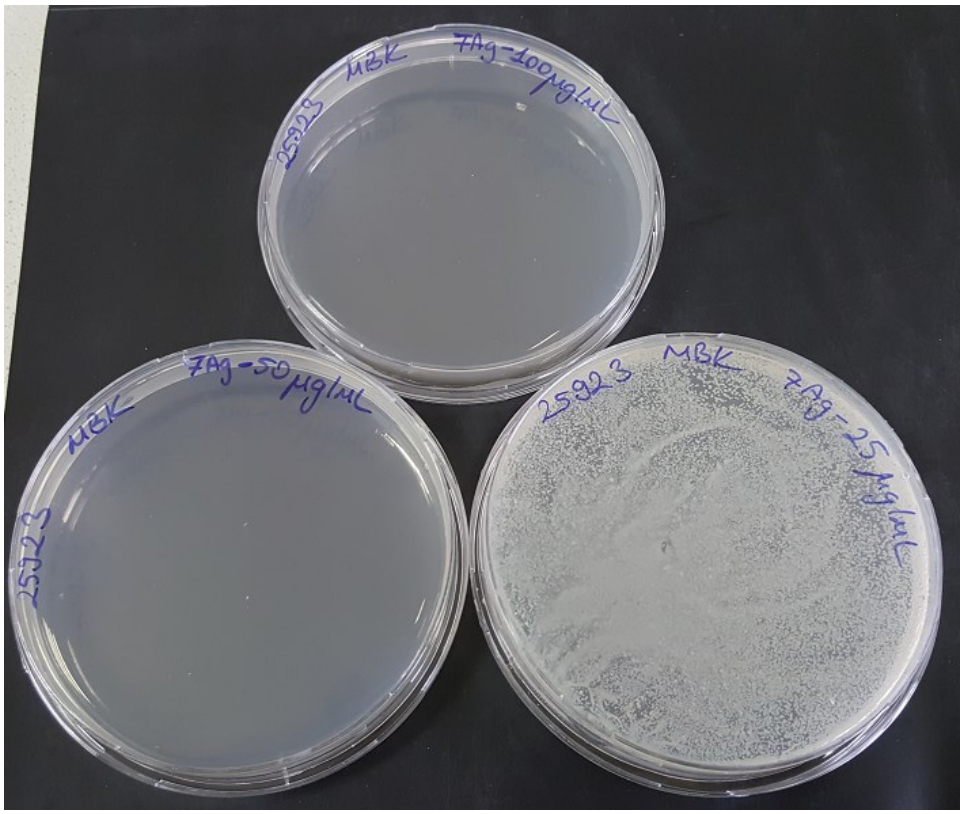

Fig. S58. Compound **3+Ag** *S.aureus* MBC test results (number 7Ag refers to compound **3+Ag)**

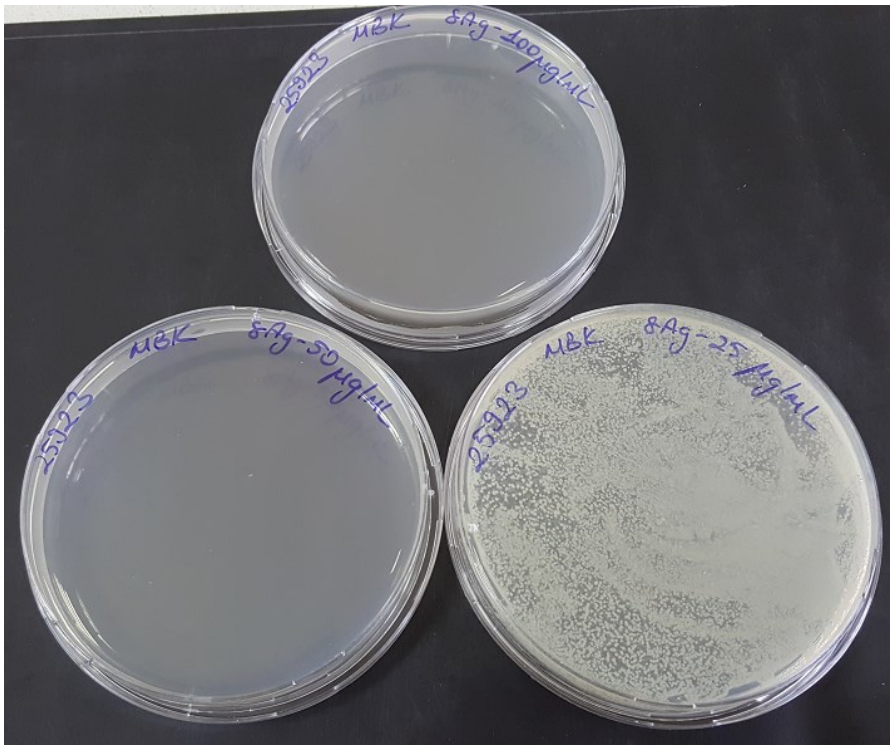

Fig. S59. Compound **4+Ag** *S.aureus* MBC test results (number 8Ag refers to compound **4+Ag)**

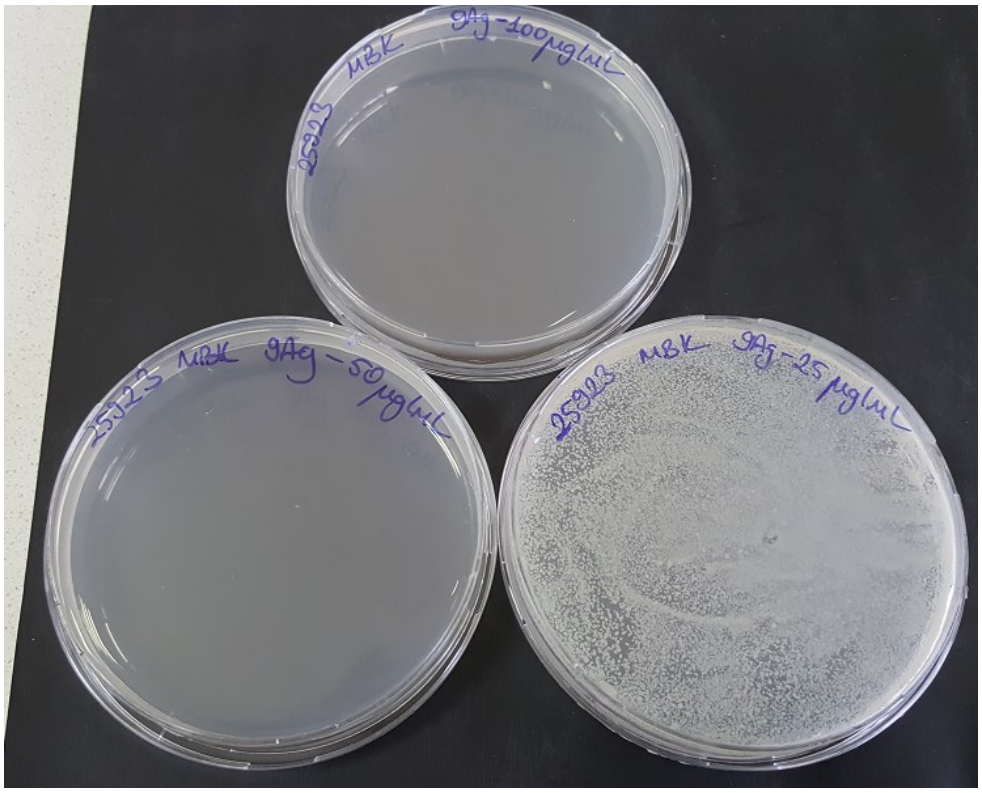

Fig. S60. Compound **5+Ag** *S.aureus* MBC test results (number 9Ag refers to compound **5+Ag)**

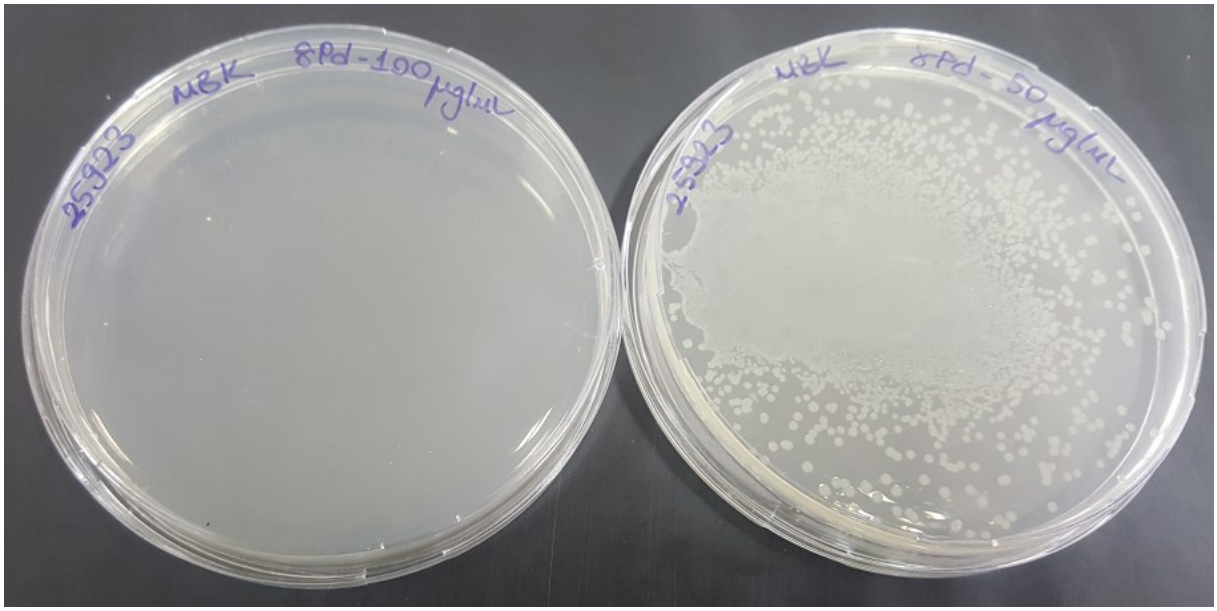

Fig. S61. Compound **4+Pd** *S.aureus* MBC test results (number 8Pd refers to compound **4+Pd)**

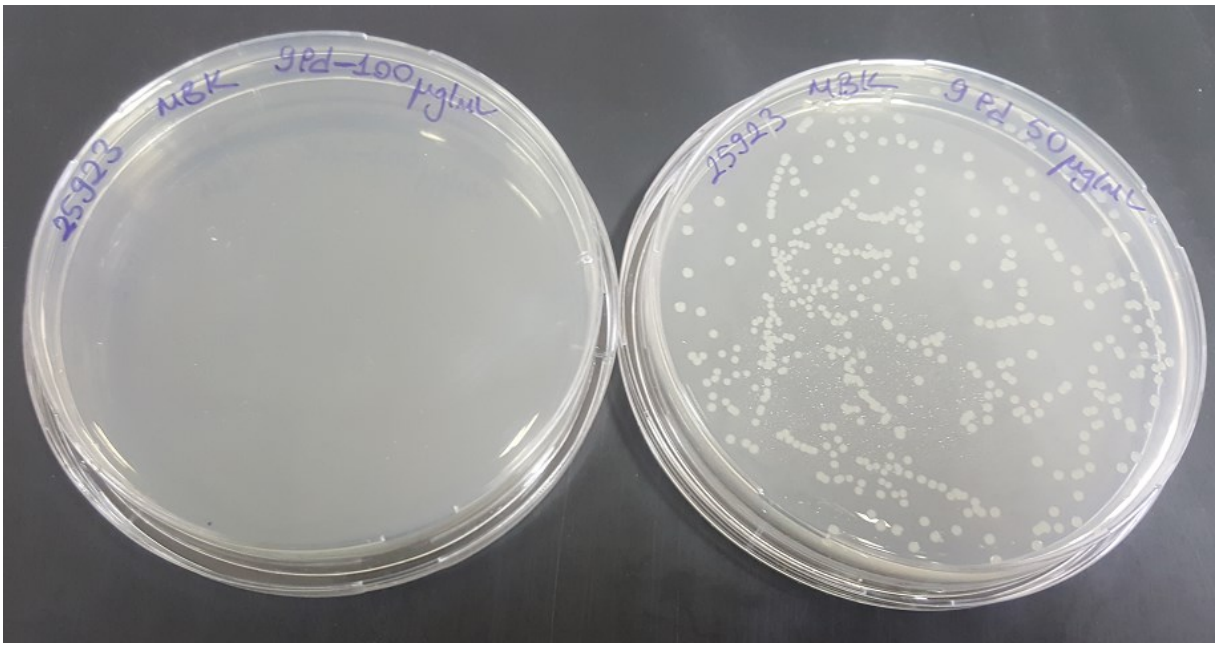

Fig. S62. Compound **5+Pd** *S.aureus* MBC test results (number 9Pd refers to compound **5+Pd)**

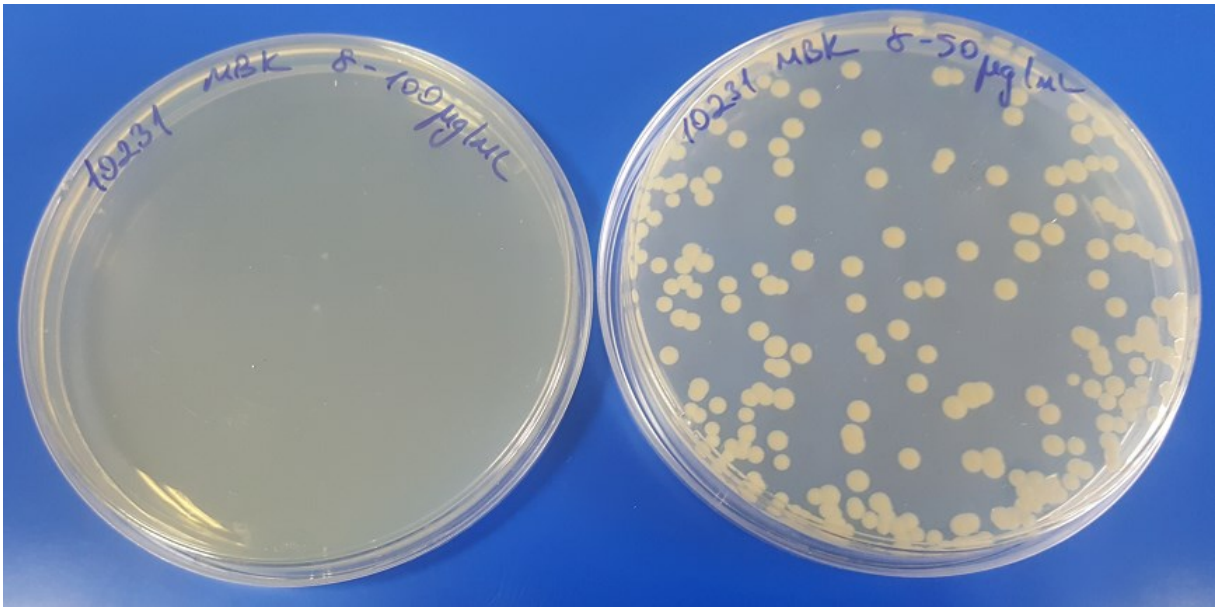

Fig. S63. Compound **4** *C.albicans* MBC test results (number 8 refers to compound **4)**

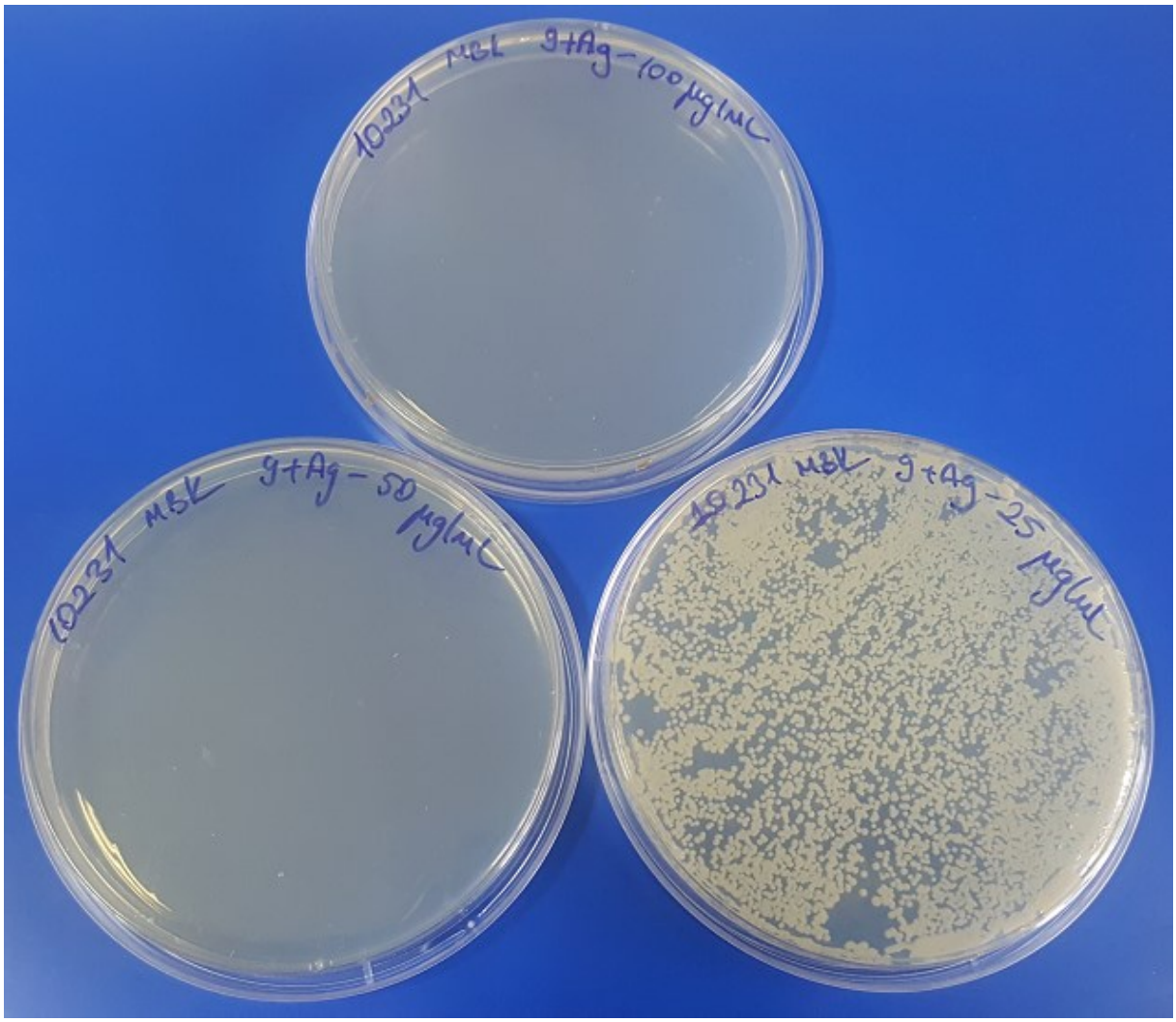

Fig. S64. Compound **5+Ag** *C.albicans* MBC test results (number 9Ag refers to compound **5+Ag)**