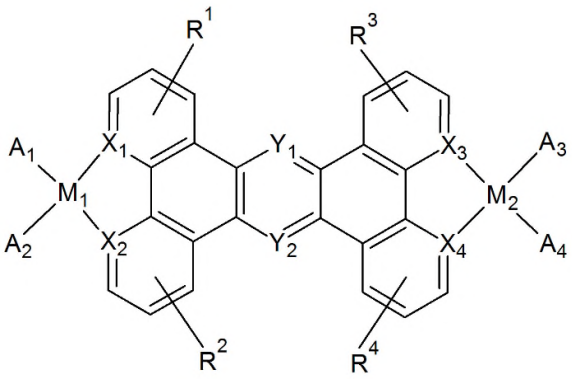
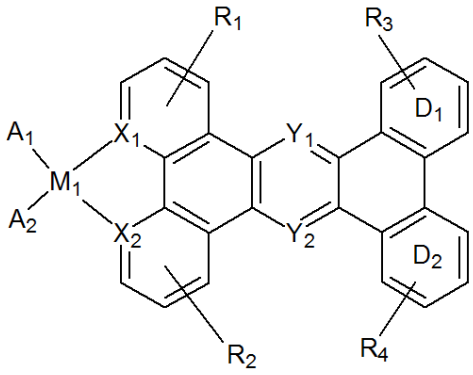
Claims

1. Use of a compound according to formula (I) or formula (Ia) in the manufacture of a medicament for use as an antimicrobial:



formula (I)



formula (Ia)

wherein,

X_1, X_2, X_3 and X_4 are each independently selected from: N;

Y_1 and Y_2 are each independently selected from: N or $C(R_a)$;

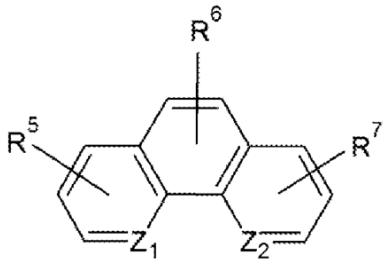
M_1 and M_2 are each a metal centre, wherein M_1 and M_2 are each ruthenium;

R_1, R_2, R_3, R_4 and R_a are each independently selected from: hydrogen, alkyl, alkenyl, aryl, halogen, haloalkyl, haloalkenyl, haloaryl, hydroxy, alkoxy, carboxylic acid, amino, amido, nitro or combination thereof;

A_1, A_2, A_3 and A_4 are each bidentate ligands; and

rings D_1 and D_2 each independently comprise one or more heteroatoms selected from N, O, S, $C(R_a)$;

wherein the bidentate ligand is a compound according to formula (III):



formula (III)

wherein,

Z_1 and Z_2 are each N; and

R_5, R_6, and R_7 are each independently selected from: hydrogen, alkyl, alkenyl, aryl, halogen, haloalkyl, haloalkenyl, haloaryl, hydroxy, alkoxy, carboxylic acid, amino, amido, nitro or combinations thereof.

2. The use according to claim 1, wherein the medicament is for use as an antibiotic.

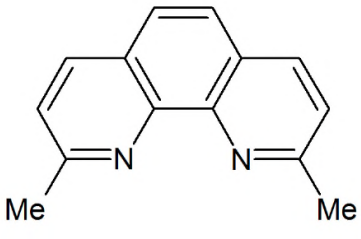
3. The use according to claim 2, wherein the medicament is for use against gram-negative bacteria.

4. The use according to any of claims 1 to 3, wherein Y_1 and Y_2 are each N.

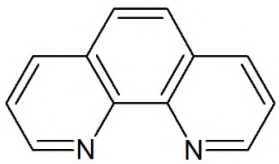
5. The use according to any of claims 1 to 4, wherein R_1, R_2, R_3, R_4 and R_a are each independently selected from: hydrogen, alkyl and aryl.

6. The use according to any of claims 1 to 5, wherein R_5, R_6, and R_7 are each independently selected from: hydrogen, alkyl and aryl.

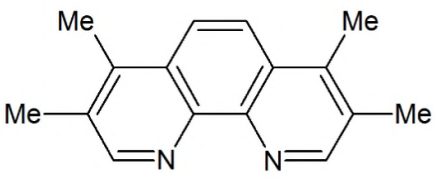
7. The use according to any of claims 1 to 6, wherein A_1, A_2, A_3 and A_4 are each bidentate ligands independently selected from **(1)** to **(7)**:



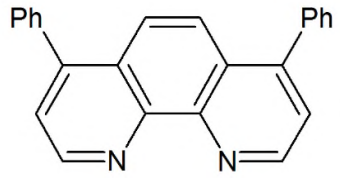
(1)



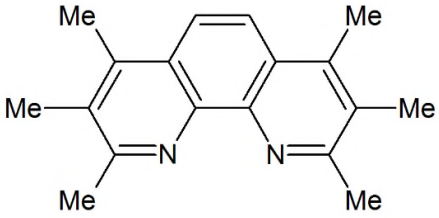
(2)



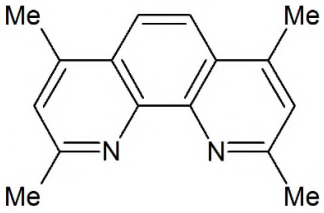
(3)



(4)



(5)



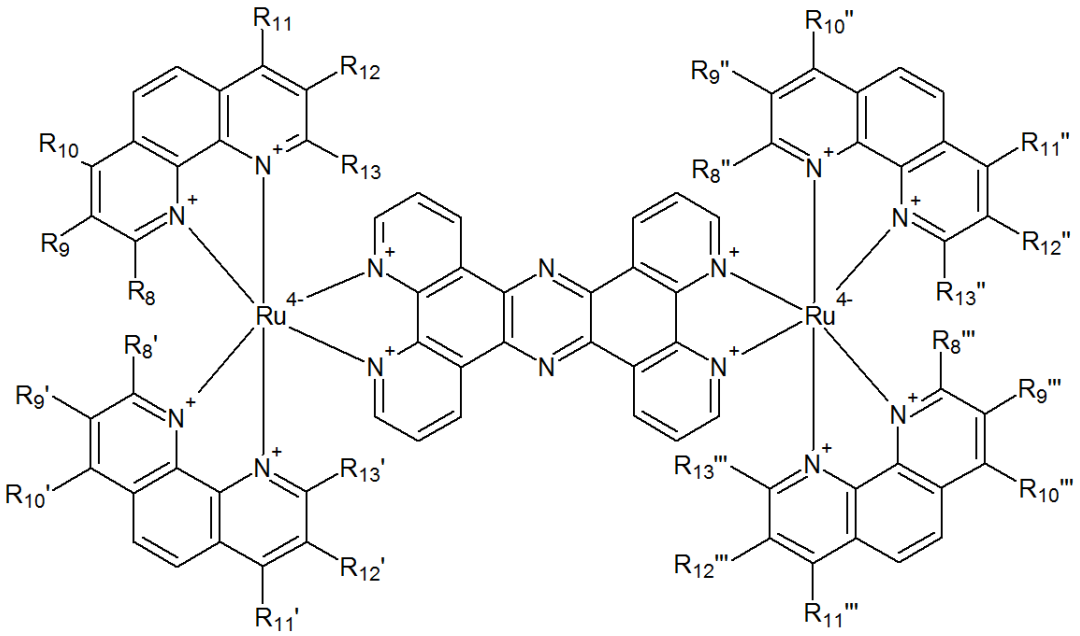
(6)



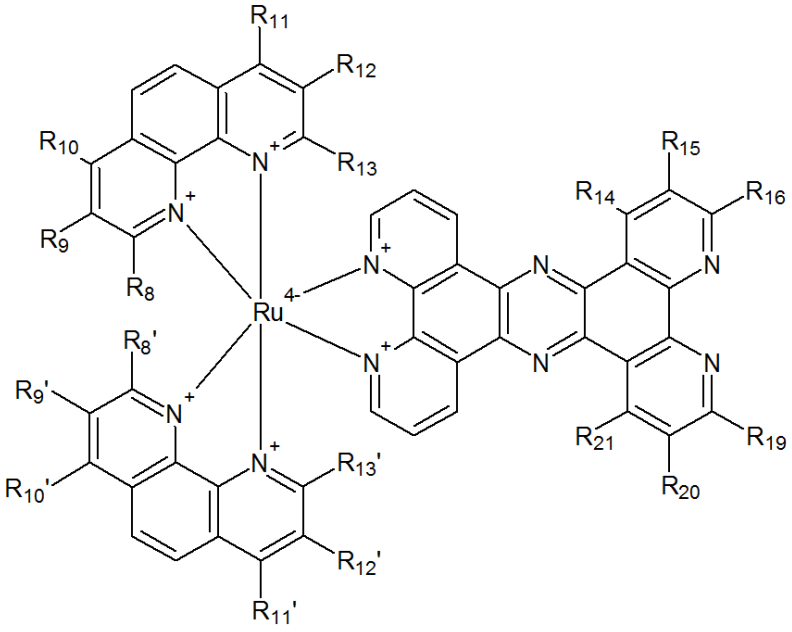
(7)

or combination thereof.

8. The use according to any one of claims 1 to 7, wherein the compound has a structure according to formula (IV) or (IVa):



formula (IV)



formula (IVa)

wherein

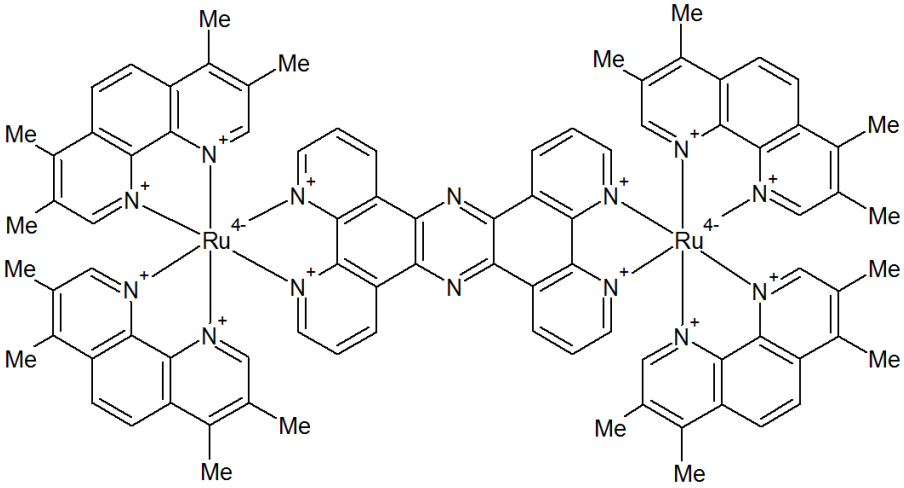
R_8, R_8', R_8'', R_8''', R_9, R_9', R_9'', R_9''', R_{10}, R_{10}', R_{10}'', R_{10}''', R_{11}, R_{11}', R_{11}'', R_{11}''', R_{12}, R_{12}', R_{12}'', R_{12}''', R_{13}, R_{13}', R_{13}'' and R_{13}''' are each independently selected from: hydrogen, alkyl, alkoxy, alkenyl and aryl;

with the proviso that at least one of R_8, R_8', R_8'', R_8''', R_9, R_9', R_9'', R_9''', R_{10}, R_{10}', R_{10}'', R_{10}''', R_{11}, R_{11}', R_{11}'', R_{11}''', R_{12}, R_{12}', R_{12}'', R_{12}''', R_{13}, R_{13}', R_{13}'' and R_{13}''' is selected from: alkyl, alkoxy, alkenyl and aryl; and

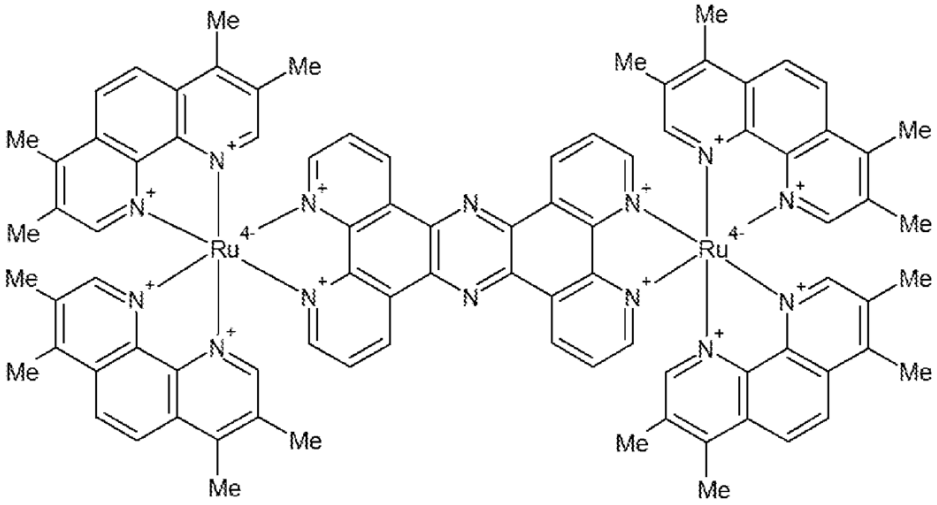
wherein R_{14}, R_{15}, R_{16}, R_{19}, R_{20} and R_{21} are each independently selected from: hydrogen, alkyl, alkenyl, aryl, halogen, hydroxy, alkoxy or combinations thereof.

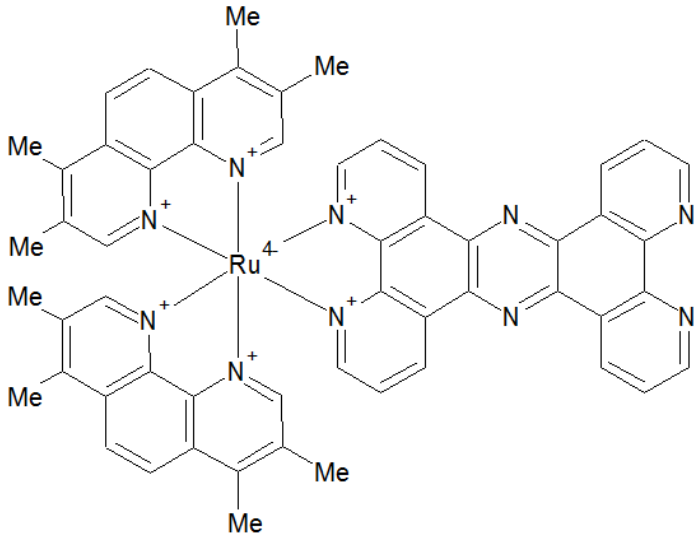
9. The use according to claim 8, wherein: R_8, R_8', R_8'' and R_8''' are identical; R_9, R_9', R_9'' and R_9''' are identical; R_{10}, R_{10}', R_{10}'' and R_{10}''' are identical; R_{11}, R_{11}', R_{11}'' and R_{11}''' are identical; R_{12}, R_{12}', R_{12}'' and R_{12}''' are identical; and R_{13}, R_{13}', R_{13}'' and R_{13}''' are identical.

10. The use according to claim 8 or claim 9, wherein the compound has a structure according to formula (V) or formula (Va):



formula (V)





formula (Va)

or pharmaceutically acceptable salt thereof.

11. Use of a composition comprising the compound according to any preceding claim in the manufacture of a medicament for use as an antimicrobial.

12. Use of the composition according to claim 11 in the manufacture of a medicament for use as an antibiotic.