Advantageously, the coating may be assembled or obtained directly or *in situ* on the substrate surface. Thus, the disclosed coating may be advantageously economical to prepare and may not require sophisticated or expensive equipment.

In one aspect, there is provided a method of killing or inhibiting the growth of a microorganism, said method comprising: contacting said microorganism with a coating wherein the coating comprises a topography having an array of projections formed of a zeolitic imidazolate framework (ZIF), wherein the ZIF comprises at least one multivalent metal species and at least one organic ligand, wherein each projection has at least one tapered distal end, and wherein said projections possess a height greater than or equal to 1 micron.

According to another aspect, there is provided a method of preparing a disinfectant, antiseptic or an antibiotic, comprising coating a surface of a substrate with a coating as defined herein.

There is also provided the use of a zeolitic imidazolate framework (ZIF) as defined herein in the manufacture of a medicament for disinfection, as an antiseptic, or for sterilization.

Definitions

The following words and terms used herein shall have the meaning indicated:

The term “array” is to be interpreted broadly to refer to multiple numbers of structures distributed within an area and spaced apart. Structures within an array do not have to have the same orientation.

The term “projection” is to be interpreted broadly to refer to a structure that extends outwards from a surface.

The term “tapered distal end” refers to a pointed apex of a structure.

The word “substantially” does not exclude “completely” e.g. a composition which is “substantially free” from Y may be completely free from Y. Where necessary, the word “substantially” may be omitted from the definition of the invention.

Unless specified otherwise, the terms "comprising" and "comprise", and grammatical variants thereof, are intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, unrecited elements.

As used herein, the term "about", in the context of concentrations of components of the formulations, typically means +/- 5% of the stated value, more typically +/- 4% of the stated value, more typically +/- 3% of the stated value, more typically, +/- 2% of the stated value, even more typically +/- 1% of the stated value, and even more typically +/- 0.5% of the stated value.

Throughout this disclosure, certain embodiments may be disclosed in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosed ranges. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

Claims

1. A method of killing or inhibiting the growth of a microorganism, said method comprising:

   contacting said microorganism with a coating wherein the coating comprises a topography having an array of projections formed of a zeolitic imidazolate framework (ZIF),

   wherein the ZIF comprises at least one multivalent metal species and at least one organic ligand,

   wherein each projection has at least one tapered distal end, and

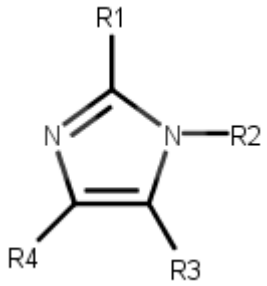
   wherein said projections possess a height greater than or equal to 1 micron.

2. The method of claim 1, wherein said multivalent metal species is tetrahedrally coordinated with said organic ligand.

3. The method of claim 1 or 2, wherein said multivalent metal species is a divalent, trivalent or tetravalent metal species or selected from the d-block of the Periodic Table of Elements or selected from the group consisting of Co, Fe, Cu, Zn and mixtures thereof.

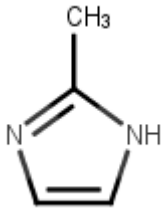
4. The method of any one of the preceding claims, wherein said organic ligand is an imidazole, an imidazole derivative, an imidazolate or a substituted imidazolate.

5. The method of any one of the preceding claims, wherein said organic ligand is derived from an imidazole having the following structure:



R1 is C_{1-10} alkyl, C_{2-10} alkenyl, C_{3-10} cycloalkyl, or phenyl;
R2 is H; and
each R3 and R4 are independently H, C_{1-10} alkyl, C_{2-10} alkenyl, C_{3-10} cycloalkyl, or phenyl;
wherein each of R1, R3 and R4 is optionally substituted with halogen, amino, hydroxy, C_{1-10} alkyl, oxo, cyano, nitro, C_{1-10} haloalkyl, C_{1-10} alkoxy and C_{1-10} haloalkoxy.

6. The method of any one of the preceding claims, wherein said organic ligand is derived from the compound:



7. The method of any one of the preceding claims, wherein said projections are spaced less than 2 μm apart or possess a width from about 0.1 to 5 μm.

8. The method of any one of the preceding claims, wherein the coating is coupled to a substrate surface.

9. The method of claim 8, wherein the metal organic framework is prepared by contacting the substrate surface with a reaction mixture comprising said organic ligand and said multivalent metal species or wherein said organic ligand is an imidazole, an imidazole derivative, an imidazolate or a substituted imidazolate.

10. The method of claim 9, wherein said organic ligand is 2-methylimidazole.

11. The method of any one of claims 9-10, wherein said multivalent metal species is Zn.

12. The method of any one of claims 9-11, wherein said organic ligand (Im) and said multivalent metal species (M) are provided in a molar ratio of Im:M of between 4:1 and 20:1.

13. The method of claim 12, wherein the molar ratio of Im:M is 7:1.

14. The method of any one of the preceding claims, wherein the ZIF has a ZIF-L crystal structure.

15. The method of any one of the preceding claims, wherein the microorganism is selected from the group consisting of gram-positive bacteria, gram-negative bacteria and fungi.

16. The method of claim 15, wherein the gram-positive bacteria is *Staphylococcus aureus*.

17. The method of claim 15, wherein the gram-negative bacteria is *Escherichia coli* or *Pseudomonas auruginosa*.

18. The method of claim 15, wherein the fungi is *Candida albicans*, yeast.

19. A method of preparing a disinfectant, antiseptic or an antibiotic, comprising coating a surface of a substrate with a coating as defined in any one of claims 1-14.

5