

Claims

- [Claim 1] A catalyst structure for ozone decomposition, the catalyst structure comprising:
a support comprising a porous inorganic material; and
an α -MnO₂ catalyst located on at least a portion of inner pores and a surface of the support.
- [Claim 2] The catalyst structure of claim 1, wherein
the porous inorganic material comprises a porous ceramic material.
- [Claim 3] The catalyst structure of claim 1, wherein
the porous inorganic material comprises a porous ceramic material including 50 % or more MgO, SiO₂, and Al₂O₃ components.
- [Claim 4] The catalyst structure of claim 3, wherein
the porous ceramic material further comprises an alkali metal oxide.
- [Claim 5] The catalyst structure of claim 1, wherein
the support is a monolith.
- [Claim 6] The catalyst structure of claim 1, wherein
the support further comprises a material selected from glass, metal, plastic, or any combination thereof.
- [Claim 7] The catalyst structure of claim 1, wherein
the α -MnO₂ catalyst is fixed to the inner pores and the surface of the support in a binder-free state.
- [Claim 8] The catalyst structure of claim 1, wherein
an amount of the α -MnO₂ catalyst is in the range of about 1 part by weight to about 10 parts by weight based on 100 parts by weight of the support.
- [Claim 9] The catalyst structure of claim 1, wherein
the α -MnO₂ catalyst comprises α -MnO₂ particles with a diameter of about 50 nm to about 5 μ m.
- [Claim 10] The catalyst structure of claim 1, wherein
the catalyst structure for ozone decomposition further comprises a catalyst selected from β -MnO₂, γ -MnO₂, amorphous MnO₂, activated carbon, and any combination thereof.
- [Claim 11] A method of cleaning air, the method comprising:
a first process of reducing hazardous gas including ethylene and harmful bacteria contained in the air using a photocatalyst reactor; and
a second process of decomposing ozone generated in the first process by using the catalyst structure for ozone decomposition according to

- claim 1.
- [Claim 12] The method of claim 11, wherein the photocatalyst reactor comprises: a vacuum UV lamp; and one or more photocatalyst structures arranged around the vacuum UV lamp.
- [Claim 13] The method of claim 12, wherein the vacuum UV lamp comprises a UV-C lamp that emits light with wavelengths of 254 nm and 185 nm in a ratio of 9:1.
- [Claim 14] The method of claim 12, wherein the photocatalyst structure comprises: a substrate; and a TiO₂ photocatalyst arranged on the substrate.
- [Claim 15] The method of claim 11, wherein the hazardous gas comprises organic or inorganic hazardous gas comprising ethylene, ammonia, acetaldehyde, or any combination thereof.
- [Claim 16] The method of claim 11, wherein the harmful bacteria comprises *Aspergillus brasiliensis*, *Escherichia Coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* subsp. aureus, or any combination thereof.
- [Claim 17] The method of claim 11, wherein the catalyst structure for ozone decomposition comprises at least one catalyst structure.
- [Claim 18] An air-cleaning device comprising: in a housing, a control area; an air inlet region; a first reaction chamber comprising a vacuum UV lamp and one or more photocatalyst structures arranged around the vacuum UV lamp; a second reaction chamber in which the catalyst structure for ozone decomposition according to claim 1 is located; and an air outlet region.
- [Claim 19] The air-cleaning device of claim 18, wherein air flows into or out of the air-cleaning device in one direction.
- [Claim 20] The air-cleaning device of claim 18, wherein a fan is installed in at least one of the air inlet region and the air outlet region.
- [Claim 21] The air-cleaning device of claim 18, wherein

the catalyst structure for ozone decomposition comprises at least one catalyst structure.

[Claim 22]

An air-cleaning system comprising an air-cleaning device including the catalyst structure for ozone decomposition according to claim 1.