Claims

1. A SO_2 adsorption material comprising a carbonized metal organic framework material and a sulfite loaded on the carbonized metal organic framework material, the carbonized metal organic framework material is a carbonized material obtained by subjecting a metal organic framework material to a carbonization treatment;

a~~the~~ loading amount of sulfite is not higher than 10 wt%, on the basis of a~~the~~ total weight of the SO_2 adsorption material.

2. The SO_2 adsorption material of claim 1, wherein the loading amount of sulfite is within a range of 2-7 wt%, on the basis of the total weight of the SO_2 adsorption material;

preferably, the sulfite is sodium sulfite and/or potassium sulfite.

3. The SO_2 adsorption material of claim 1 or 2, wherein said carbonized metal organic framework material has a regular, porous and cage-like topological structure with a bulk density of 0.2-0.35 g/cm^3, a specific surface area of 1,000-2,700 m^2/g, a pore volume of 1-3.8 cm^3/g, and (macropore volume + mesopore volume)/micropore volume =0.16-3.5;

preferably, said carbonized metal organic framework material has a regular, porous and cage-like topological structure with a bulk density of 0.22-0.33 g/cm^3, a specific surface area of 1,025-2,650 m^2/g, a pore

volume of 1.06-3.7 cm^3/g, and (macropore volume + mesopore volume)/micropore volume =2.3-3.5.

4. The SO_2 adsorption material of any of claims 1 to 3, wherein the SO_2 adsorption material has a bulk density of 0.2-0.39 g/cm^3, a specific surface area of 1,000-2,700 m^2/g, a pore volume of 1-3.7 cm^3/g, and (macropore volume + mesopore volume)/micropore volume =0.21-3.5;

preferably, the SO_2 adsorption material has a bulk density of 0.21-0.35 g/cm^3, a specific surface area of 2,000-2,650 m^2/g, a pore volume of 2.8-3.7 cm^3/g, and (macropore volume + mesopore volume)/micropore volume =2.3-3.5.

5. The SO_2 adsorption material of any of claims 1 to 4, wherein the metal organic framework material is a zinc-based metal organic framework material;

preferably, the metal organic framework material is at least one selected from the group consisting of MOF-5, MOF-74, ZIF-8, ZIF-7 and ZIF-20;

preferably, the metal organic framework material is MOF-5 having a specific surface area within a range of 1,500-1,700 m^2/g and a pore volume within a range of 1-1.15 cm^3/g.

6. The SO_2 adsorption material of any of claims 1 to 5, wherein the

carbonization treatment is carried out in a protective atmosphere under a carbonization temperature of 900-1,150°C for a carbonization time of 5-10h.

7. The SO_2 adsorption material of any of claims 1 to 6, wherein the metal organic framework material contains a metal element in an amount of 20-35 wt%.

8. The SO_2 adsorption material of any of claims 1 to 7, wherein the content of metal elements in the carbonized metal organic framework material is within a range of 0-0.06 wt%, preferably 0-0.02 wt%.

9~~7~~. A method for preparing a SO_2 adsorption material, wherein the method comprises the following steps:

(1) subjecting a~~the~~ metal organic framework material to a carbonization treatment to remove at least a portion of the metal elements contained in the metal organic framework material, so as to obtain a carbonized metal organic framework material;

(2) loading sulfite on the carbonized metal organic framework material to prepare the SO_2 adsorption material;

said carbonized metal organic framework material and said sulfite are used in an amount such that a~~the~~ loading amount of sulfite is not higher

than 10 wt%, preferably 2-7 wt%, on the basis of a~~the~~ total weight of the SO_2 adsorption material.

10~~8~~. The method of claim 9~~7~~, wherein the carbonization treatment in step (1) is carried out in a protective atmosphere under a carbonization temperature of 900-1,150°C for a carbonization time of 5-10h.

11. The method of claim 10, wherein the protective atmosphere is provided by at least one substance selected from the group consisting of nitrogen gas, argon gas, helium gas and neon gas.

12~~9~~. The method of any one of claims 9~~7~~ to~~or~~ 11~~8~~, wherein the modes of loading sulfite on the carbonized metal organic framework material in step (2) comprise impregnating the carbonized metal organic framework material with a sulfite solution, and drying the impregnated carbonized metal organic framework material to remove the solvent;
preferably, the sulfite solution has a mass concentration less than 6%;
preferably, the drying is carried out in an inert atmosphere, the drying temperature is within a range of 100-120°C, and the drying time is within a range of 6-10h.

13~~10~~. The method of any of claims 9~~7~~ to 12~~9~~, wherein the sulfite is

sodium sulfite and/or potassium sulfite.

14~~11~~. The method of any of claims 9~~7~~ to 13~~10~~, wherein the metal organic framework material is selected from zinc-based metal organic framework materials;

preferably, the metal organic framework material is at least one selected from the group consisting of MOF-5, MOF-74, ZIF-8, ZIF-7 and ZIF-20;

preferably, the metal organic framework material is MOF-5 having a specific surface area within a range of 1,500-1,700 m^2/g and a pore volume within a range of 1-1.15 cm^3/g.

15. The method of claim 12, wherein impregnating the carbonized metal organic framework is carried out for a time in the range of 1-5h.

16. The method of claim 12, wherein the sulfite solution has a mass concentration within a range of 1.2-4%.

17. The method of any one of claims 9 to 16, wherein the sulfite is sodium sulfite and/or potassium sulfite.

~~12. The SO_2 adsorption material prepared with the method of any of claims 7 to 11.~~

1813. Use of athe SO_2 adsorption material ~~of any one of claims 1 to 6 and 12~~ in the field of desulfurization, wherein the SO_2 adsorption material comprises a carbonized metal organic framework material and a sulfite loaded on the carbonized metal organic framework material, and the carbonized metal organic framework material is a carbonized material obtained by subjecting a metal organic framework material to a carbonization treatment; and

a loading amount of sulfite is not higher than 10 wt%, on the basis of a total weight of the SO_2 adsorption material.

1914. A method for removing SO_2 from a SO_2-containing flue gas containing SO_2, comprisinges athe step of contacting athe SO_2 adsorption material with the SO_2-containing flue gas to be treated for adsorption treatment, wherein said SO_2 adsorption material ~~is the SO_2 adsorption material of any of claims 1 to 6 and 12~~ comprises a carbonized metal organic framework material and a sulfite loaded on the carbonized metal organic framework material, and the carbonized metal organic framework material is a carbonized material obtained by subjecting a metal organic framework material to a carbonization treatment; and

a loading amount of sulfite is not higher than 10 wt%, on the basis of a total weight of the SO_2 adsorption material.

2015. The method of claim 1914, wherein the conditions of the adsorption treatment comprise: an adsorption temperature of 5-25°C, an adsorption volumetric hourly space velocity of 100-1,000h^{-1}, and an adsorption pressure of 0-0.3MPa;

preferably, the SO_2-containing flue gas to be treated comprises SO_2 in a volume content of 1-5% and water vapor in an volume content of 1-4%.