## CLAIMS

**1**. A process for producing dimethyl sulfoxide, comprising:

(1) contacting hydrogen sulfide with methanol to produce a mixture containing dimethyl sulfide, and separating dimethyl sulfide from the mixture; and

(2) in the presence of a solvent, contacting a dimethyl sulfide feed obtained in step (1) with at least one oxidant and a catalyst to produce a mixture containing dimethyl sulfoxide,

wherein said catalyst comprises at least one Ti—Si molecular sieve, and wherein the solvent is water.

**2**. The process of claim **1**, wherein, in step (2), the contacting of the dimethyl sulfide feed with the at least one oxidant and the catalyst is conducted in a reaction zone of a catalytic distillation reactor, a mixture containing an unreacted dimethyl sulfide is obtained at the top of the catalytic distillation reactor, the mixture containing dimethyl sulfoxide is obtained at the bottom of the catalytic distillation reactor, and the reaction zone is loaded with the catalyst.

**3**. The process of claim **2**, wherein the oxidant and the solvent are fed through the first feeding port to the reaction zone; the dimethyl sulfide feed is fed through the second feeding port to the reaction zone; a theoretical column plate number from the first feeding port to the bottom of the reaction zone is T1, the theoretical column plate number from the second feeding port to the bottom of the reaction zone is T2, and T1>T2.

**4**. The process of claim **3**, wherein the theoretical column plate number of the reaction zone is T, a ratio of T1 to T expressed in percentage is 50-100%, the ratio of T2 to T expressed in percentage is 10-80%.

5. The process of claim 4, wherein the ratio of T1 to T expressed in percentage is 80-100%, the ratio of T2 to T expressed in percentage is 10-30%.

6. The process of claim 1, wherein, in step (2), the dimethyl sulfide feed and the catalyst are in contact in a batch reactor at a mass ratio of 0.1-100:1; or the dimethyl sulfide feed and the catalyst are in contact in a fixed bed reactor at a weight hourly space velocity of the dimethyl sulfide feed of 0.1-10000 $h^{-1}$.

7. The process of claim 1, wherein said catalyst comprises the Ti—Si molecular sieve and a support, based on a total amount of the catalyst, a content of the Ti—Si molecular sieve is 10-99 wt % and a content of the support is 1-90 wt %.

8. The process of claim 7, further comprising: mixing at least one organosilicon compound capable of hydrolysis and at least one water-soluble alkali with water to obtain a first mixture, mixing the first mixture the Ti—Si molecular sieve to form a second mixture, granulating and calcining the second mixture.

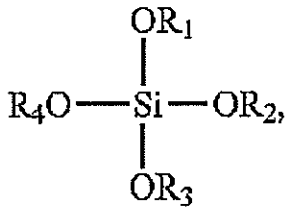
9. The process of claim 7, wherein the Ti—Si molecular sieve, the organosilicon compound, the water-soluble alkali and water are at a mass ratio of 100:10-2000:2-40:50-2000.

10. The process of claim 8, wherein the water-soluble alkali is a template agent for synthesizing the Ti—Si molecular sieve.

11. The process of claim 10, wherein the template agent for synthesizing the Ti—Si molecular sieve is quaternary ammonium base.

12. The process of claim 8, wherein the organosilicon compound is a compound of formula (I)

(I)



wherein each of $R_1$, $R_2$, $R_3$ and $R_4$ is $C_1$-$C_4$ alkyl.

**13**. The process of claim **1**, wherein the Ti—Si molecular sieve is a MFI-type Ti—Si molecular sieve.

**14**. The process of claim **13**, wherein a grain of the Ti—Si molecular sieve is a hollow structure having a cavity with a radial length of 5-300 nm, the Ti—Si molecular sieve has a benzene adsorption capacity of at least 70 mg/q, measured at 25° C., P/P0=0.10, and an adsorption time=1 hour, and there is a hysteresis loop between the adsorption isotherm and the desorption isotherm of the low temperature nitrogen adsorption of the Ti—Si molecular sieve.

**15**. The process of claim **1**, wherein, in step (2), a molar ratio of the dimethyl sulfide feed to the oxidant is 1:0.1-2.

**16**. The process of claim **1**, wherein the oxidant is a peroxide.

**17**. The process of claim **16**, wherein the oxidant is hydrogen peroxide.

**18**. The process of claim **1**, wherein, in step (2), the dimethyl sulfide feed and the solvent are at a mass ratio of 1:0.5-50.

**19**. The process of claim **1**, wherein, in step (2), the contacting of the dimethyl sulfide feed with the at least one oxidant and the catalyst is carried out at 20-200° C. under a gauge pressure of 0.1-3 MPa.

**20**. The process of claim **1**, wherein, in step (1), contacting hydrogen sulfide with methanol to produce the mixture containing dimethyl sulfide is conducted in the presence of γ-Al2O3.

**21**. The process of claim **20**, wherein a weight ratio of hydrogen sulfide to γ-Al2O3 is 1:0.1-100.

**22**. The process of claim **1**, wherein a molar ratio of hydrogen sulfide to methanol is 100-0.5:1.

**23**. The process of claim **1**, wherein, in step (1), contacting hydrogen sulfide with methanol to produce the mixture containing dimethyl sulfide is conducted at 200-400° C.

**24**. The process of claim **1**, wherein, in step (2), the dimethyl sulfide feed and the solvent are at a mass ratio of 1:1-20.