What is claimed is:

1. A preparation method of a propylene epoxidation catalyst, comprising the following steps:

(1) titanate and ammonium molybdate are dissolved in a low-carbon alcohol, and mixed with a silica gel support to perform a rotary evaporation treatment to remove the low-carbon alcohol to obtain a catalyst precursor;

(2) a calcination treatment is performed on the catalyst precursor obtained in step (1) at elevated temperature to obtain an oxide catalyst, wherein conditions of the calcination treatment are: a calcination atmosphere is ammonia gas, and a two-stage temperature programming is adopted, in which in a first stage, a calcination temperature is 140 ℃ to 160 ℃, a calcination duration is 1 to 3 h, and a space velocity of the ammonia gas is 2 to 5 h^{-1}, and in a second stage, a calcination temperature is 450 ℃ to 600 ℃, a calcination duration is 3 to 5 h, and a space velocity of the ammonia gas is 0.4 to 2 h^{-1}; and

(3) a silylation treatment is performed on the oxide catalyst obtained in step (2) using a silylating reagent to obtain the propylene epoxidation catalyst.

2. The preparation method according to claim 1, wherein in step (1), the amount of Ti in the titanate is 2 to 5 wt% of the mass of the silica gel support in step (1), and the concentration of the titanate in the low-carbon alcohol is 1 to 10 wt%; and preferably, the titanate is one or more selected from the group consisiting of tetramethyl titanate, tetraethyl titanate, tetrapropyl titanate, tetraisopropyl titanate, tetrabutyl titanate, and tetraisobutyl titanate.

3. The preparation method according to claim 2, wherein in step (1), the amount ratio of titanate to ammonium molybdate is such that the molar ratio of Mo to Ti is 0.05:1 to 0.2:1.

4. The preparation method according to any one of claims 1 to 3, wherein the silica gel support in step (1) has an equivalent spherical diameter of 0.5 to 3 mm and a specific surface area of 800 to 900 m^2/g; and preferably, the silica gel support has an average pore size of 2 to 3 nm.

5. The preparation method according to claim 1, wherein in step (2), the content of N in the oxide catalyst obtained after the calcination treatment is greater than 0.2 wt%, preferably greater than 0.28 wt%.

6. The preparation method according to any one of claims 1 to 3, wherein the silylating reagent in step (3) is hexamethyldisilazane, and the temperature of the silylation treatment is 200 ℃ to

300 ℃; and preferably, the amount of the silylating reagent is 5 to 15 wt% of the mass of the silica gel support, and the duration of the silylation treatment is 60 to 180 min.

7. The preparation method according to any one of claims 1 to 3, wherein during the rotary evaporation treatment in step (1), a rotary evaporation speed is 10 to 100 rpm, a rotary evaporation temperature is 50 ℃ to 70 ℃, and a pressure is 50 to 100 KPa.

8. Use of the propylene epoxidation catalyst prepared by the preparation method according to any one of claims 1 to 7 in catalyzing a propylene epoxidation reaction;

preferably, the propylene epoxidation reaction is a reaction in which propylene is reacted with cumene hydroperoxide as an oxidizing agent to prepare propylene oxide; further preferably, in the reaction, the molar ratio of the propylene to the cumene hydroperoxide is 5:1 to 7:1, and a weight hourly space velocity is 2 to 3.5 h^{-1}.