CLAIMS

1. A process for synthesis of a catalyst for the oxidative dehydrogenation of ethane to ethylene having a selectivity to ethylene of not less than 90% and a 25% conversion of ethane to ethylene at from 365 to 380 ° C via the hydrothermal treatment comprising:

i) preparing an aqueous slurry comprising Mo, V, Nb and Te salts in a molar ratio of metal elements 1: 0.52 to 0.80: 0.12 to 0.18: 0.13 to 0.19 at a temperature from 25°C to 80°C;

ii) heating slurry in a reaction vessel to a temperature from 80° to 220°C at a pressure from 10 psi to 190 psi (960 kPa to 1300 kPa), for a period of time not less than 1 hour with agitation and simultaneous removal of gaseous byproduct species produced during the reaction.

iii) letting the reactor cool and depressurizing the reactor and recovering the solid product.

2. The process according to claim 1, wherein the temperature of the reactor is from 150°C – 185°C.

3. The process according to claim 1, wherein optionally there is a condenser upstream of the pressure control device.

4. The process according to 3, wherein the condenser is operated at a temperature above 0°C and below reaction temperature.

5. The process according to claim 1, wherein the gaseous species are vented from the reactor.

6. The process according 1, wherein the gaseous species are removed from the reactor using one or more methods selected from the group consisting of gas absorption, membrane separation, and chemicals transformation.

7. The process according to claim 1 wherein the time of hydrothermal treatment is from 1 to 72 hours.

8. The process according to claim 7, wherein the reactor is metal.

9. The process according to claim 8, wherein the reactor can be lined or contain glass fibers, beads, or other nucleating agents.

10. The process according to claim 9, where in the lining comprises one or more of ceramic based material, a different metal, fluorocarbon polymers and combinations thereof.

11. The process according to claim 10, further including separating the resulting precatalyst from the aqueous phase and washing it with distilled water or an aqueous oxalate solution and drying the precatalyst.

12. The process according to claim 11, comprising further grinding the dried precatalyst.

13. The process according to claim 12, further including calcining the catalyst in an inert atmosphere at a temperature from 200°C to 650°C for a time from 1 to 20 hours.

14. The process according to claim 13 wherein the calcined product comprises the following molar ratios: Mo1 : V 0.32-0.49 : Te 0.10-0.17 : Nb 0.14-0.17 as determine by PIXE.

15. A method for the oxidative dehydrogenation of a mixed feed comprising ethane and oxygen in a volume ratio from 70:30 to 95:5 and optionally one or more C_{3-6} alkanes or alkenes and oxygenated species including CO and CO_2 at a temperature from 375°C to 400°C, a gas hourly space velocity from 100 hr^{-1} to 3000 hr^{-1}, a pressure from 0.8 to 7 atmospheres, and a selectivity to ethylene of not less than 90% comprising passing said mixture over the calcined catalyst of the formula $Mo_1V_{0.36-0.40}$ $Te_{0.11-0.17}$ $Nb_{0.14-0.17}$.

16. The method according to claim 15, wherein the gas hourly space velocity of not less than 500 $hr.^{-1}$.

17. The method according to claim 15, wherein the calcined catalyst forms a fixed bed.