WHAT IS CLAIMED IS:

1. A process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, comprising steps of:

firstly processing uncatalyzed oxidation on cyclohexane by molecular oxygen, in such a manner that an oxidized mixture with cyclohexyl hydrogen peroxide serving as a primary product is generated;

then decomposing the cyclohexyl hydrogen peroxide to produce cyclohexanol and cyclohexanone; and

then rectifying to obtain a cyclohexanol product and a cyclohexanone product;

wherein the step of decomposing the cyclohexyl hydrogen peroxide utilizes a three-step decomposition process combining a homogeneous catalytic decomposition process of bis(tert-butyl) chromate with a heterogeneous catalytic decomposition process of sodium hydroxide alkaline aqueous solution, comprising steps of:

(1) performing the homogeneous catalytic decomposition by utilizing the bis(tert-butyl) chromate as a catalyst, adding 1-hydroxy ethidene-1, 1-diphosphonic acid (di)octyl ester for serving as a scale inhibitor, wherein adding amount of the 1-hydroxy ethidene-1, 1-diphosphonic acid (di)octyl ester is equivalent to adding amount of Chromium which is an active component of the catalyst; wherein the decomposition temperature is at a range of 90±10°C, the decomposition pressure is at an atmospheric pressure, and the reactor residence time is at a range of 24~26 minutes;

(2) performing the heterogeneous catalytic decomposition in the sodium hydroxide alkaline aqueous solution under low alkalinity, wherein the low alkalinity means that a molar concentration of OH^- is at a range of 0.2~0.8mol/L ; and

(3) performing the heterogeneous catalytic decomposition in the sodium hydroxide alkaline aqueous solution under high alkalinity, wherein the high alkalinity means that a molar concentration of OH^- is at a range of 0.9~2.2mol/L.

2. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in claim 1, wherein in the step (1) of decomposing the cyclohexyl hydrogen peroxide, while performing the homogeneous catalytic decomposition by utilizing the bis(tert-butyl) chromate as the catalyst, adding amount of the catalyst is equivalent to that a mass fraction of Chromium in cyclohexane oxidation liquid is at a range of 12±8ppm.

~~3. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in claim 2, wherein while performing the homogeneous catalytic decomposition by utilizing the bis(tert-butyl) chromate as the catalyst, a decomposition temperature is at a range of 60°C~160 °C, a decomposition pressure is at a range of 0.05MPa~1.3MPa, and a reactor residence time is at a range of 20~40 minutes, wherein the decomposition pressure is an absolute pressure.~~

~~4. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in claim 3, wherein while performing the homogeneous catalytic decomposition by utilizing the bis(tert-butyl) chromate as the catalyst, the decomposition temperature is at a range of 90±10°C, the decomposition pressure is at an atmospheric pressure, and the reactor residence time is at a range of 24~26 minutes.~~

~~5.~~3. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in claim 41, wherein the reactor residence time is 25 minutes.

~~6. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in anyone of the claims 1~5, wherein the step of performing the homogeneous catalytic decomposition by utilizing the bis(tert-butyl) chromate as the catalyst further comprises: adding 1-hydroxy ethidene-1, 1-diphosphonic acid (di)octyl ester for serving as a scale inhibitor, wherein adding amount of the 1-hydroxy ethidene-1, 1-diphosphonic acid (di)octyl ester is equivalent to adding amount of Chromium which is an active component of the catalyst.~~

~~7.~~4. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in any one of the claims 1~~5~~3, wherein in the step (2) for decomposing the cyclohexyl hydrogen peroxide under low alkalinity, a molarity of OH^- in sodium hydroxide aqueous solution is at a range of 0.5±0.2mol/L, and a reactor residence time is at a range of 5~7 minutes.

~~8.~~5. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in claim ~~7~~4, wherein the reactor residence time is 6 minutes.

~~9.~~6. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in any one of the claims 1~~5~~4, wherein in the step (3) for decomposing the cyclohexyl hydrogen peroxide under high alkalinity, a molarity of OH^- in sodium hydroxide aqueous solution is at a range of 1.5±0.5mol/L, and a reactor residence time is at a range of 7~9 minutes.

~~10.~~7. The process for preparing cyclohexanol and cyclohexanone by cyclohexane oxidation, as recited in claim ~~9~~6, wherein the reactor residence time is 8 minutes.