Appendix A: Supporting information (SI):

Oxygen vacancies enhanced photocatalytic removal of NO over N-doped TiO_2 catalyst

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SI .1 Calculation of energy band

The Eg value was calculated by the Graetzel relation. The Graetzel relation：

Eg = 1240/λ_g (eV)　(λ_g : Absorption wavelength threshold).

SI.2 XPS of TiO_2 sample

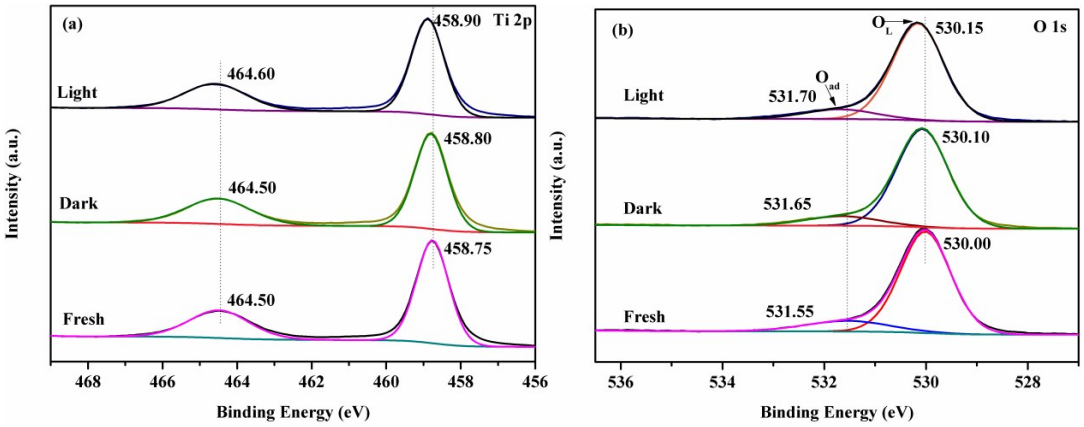

Fig.S1. High-resolution XPS spectra for TiO_2 sample of fresh, after reacted in dark or under visible irradiation: (a) Ti 2p and (b) O 1s.

Table S1 The High-resolution XPS spectra area for TiO_2 sample of O 1s.

Name	Fresh sample(Area (P) CPS.eV)	Reacted in dark (Area (P) CPS.eV)	Reacted in light(Area (P) CPS.eV)
$O_{(L)}$	299486	296418	290087
$O_{(ad)}$	51918	40309	40358

The electron binding energy for Ti2p and O1s of TiO_2 sample exhibited an increasing tendency from fresh to after reacted in dark and then reacted under visible light irradiation, suggesting that TiO_2 sample could be oxidized by O_2 gas and then O_2 gas got electrons forming $\cdot O_2^-$ species ($O_2 + e^- \rightarrow \cdot O_2^-$). In addition, as shown in table 1, the peak at about 530.15 eV was assigned to the lattice oxygen species.

SI.3 O_2-TPD of TiO_2 sample

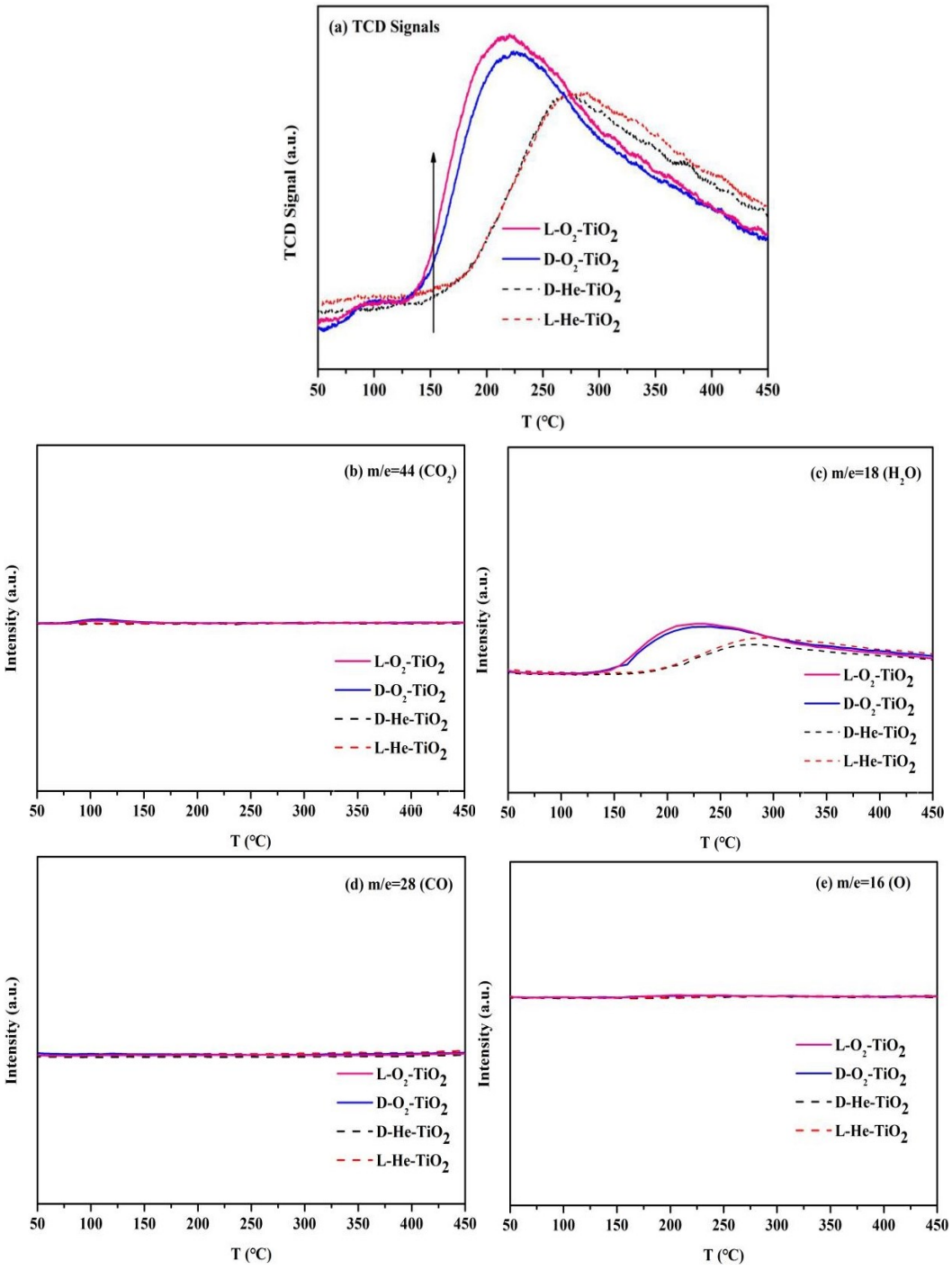

Fig. S2. The O_2-TPD-Ms results of TiO_2 catalyst after pre-adsorb O_2 and He under visible light or not. (catalyst dosage: 0.1 g、He was injected during heating).

The O_2-TPD testing grape of TiO_2 samples showed a signal peaks at 225 ^{0}C, ascribed to the produce of H_2O species in combination with the mass spectrum result.

SI.4 Assignment hydroxyl of FT-IR spectra

Table S2 Assigned hydroxyl of FT-IR spectra of adsorbing NO or NO+O_2 over TiO_2 and N-TiO_2 samples under visible light irradiation, respectively.

Sample bands	Terminal-OH	Bridged isolated -OH	Single coordinated -OH	Bridged -OH	doubly coordinated -OH
N-TiO_2（NO）	3730	3700	3670		3475
N-TiO_2（NO+O_2）	3732 3716		3679， 3652	3612	3470