Response Letter and Summary of Changes

We thank the reviewers for their helpful comments and suggestions to improve the manuscript. Changes were made in the revised manuscript (highlighted in green for easy identification) according to the reviewers’ comments. The following summarizes our responses to the points raised.

Reviewer 3:

- Rev 3, point 1. No information about the manufacturer/reseller nor the batch number/code of the P25 material were added.

Thanks for the useful comments. The properties of P25 has been added to the revised manuscript.

- Rev. 3, point 2. No direct (brief) comparison with the existing state of the art was added, although requested. Moreover, some clear statements about the points of novelty were described in the response letter, but no additions were reported in the Introduction section of the revised text (this is the part in which the most innovative achievements should be announced).

Thanks for the comment. The points of novelty has been added to the manuscript.

- Rev. 3, point 3. No mention about the monitoring of CO₂ evolution was added to the revised text. No mention about the CO and CO₂ analyser is present in the Experimental section. Some data about CO₂ production and evolution should be added in the final text, at least as supplementary material.

Thanks for the comment. CO₂ produced in gas phase was monitored by continuous analyzers, measuring CO, CO₂ (Uras 14, ABB) gaseous concentrations. The produced CO₂ in gas phase was monitored by continuous analyzers, measuring CO, CO2 (Uras 26, ABB) gaseous
concentrations. Fig. S4 shows the concentration of variation of CO$_2$ produced during the photocatalytic degradation of MB by using samples as a photocatalyst under simulated sunlight irradiation. It could be clearly seen from Fig. S4 that the concentration of CO$_2$ gradually increased along the light irradiation time.

![Graph showing CO$_2$ production during photocatalytic degradation of MB](image)

**Fig. S4.** CO$_2$ production during the photocatalytic degradation of MB

- Rev. 2, point 1. The statement “O2-vacancy” is not correct, but it was not changed in the revised manuscript.

Thanks for the comment. This mistake has been corrected in the revised manuscript.
• Rev. 2, point 8. The Reviewer asked how the contact of atmospheric oxygen with the suspension was assured during the reaction. However, the reply is misleading and does not touch this issue.

Thanks for the comment. The contact of atmospheric oxygen with suspension is provided by reaction in the air atmosphere. Meanwhile, the $\text{O}_2$ in the eq. 5 ($\text{O}_2 + e^- \rightarrow \text{O}_2^-$), indicates the dissolved oxygen in the MB aqueous solution not in the air. The main species for the degradation of pollutants is $\text{OH}^-$. 

• Rev. 2, point 11. A clarification about the binding energy correction in XPS data was requested. Some explanation is reported in the response letter (with some additional references too), but none of these new statements was reported in the emended text.

Thanks for the comment. This explanation has been added to the revised manuscript.