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EVALUATION OF PHOTOCATALYTIC PERFORMANCE OF HYDROGEN PRODUCTION FROM GLYCEROL

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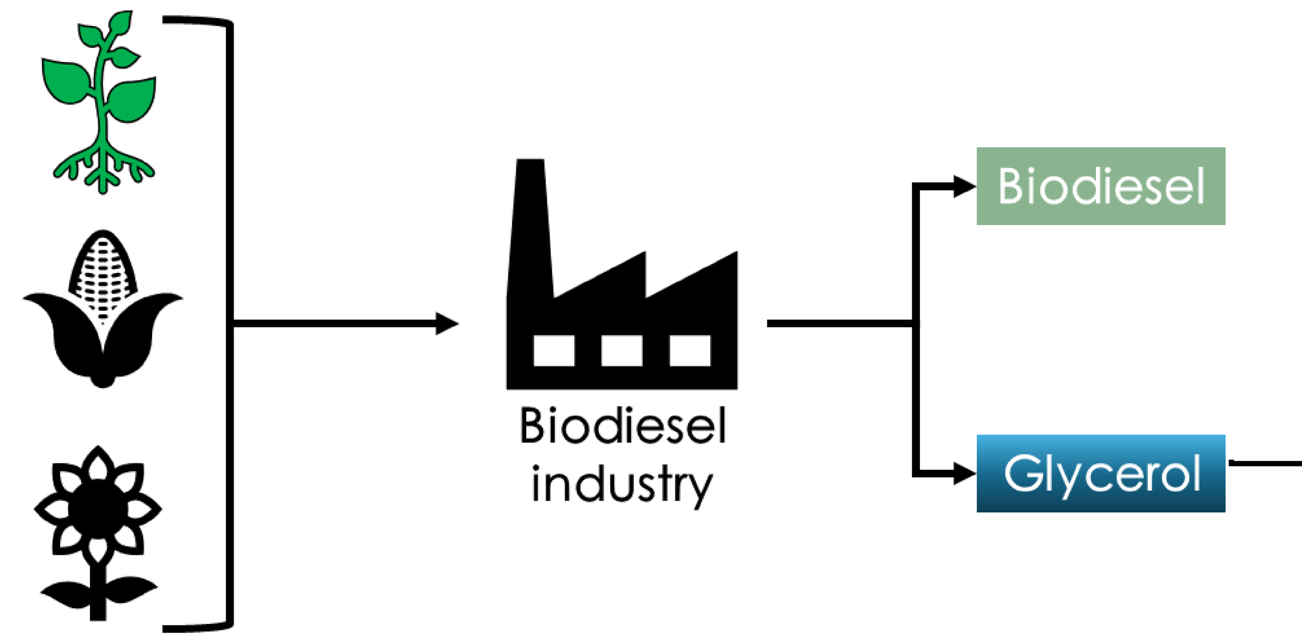
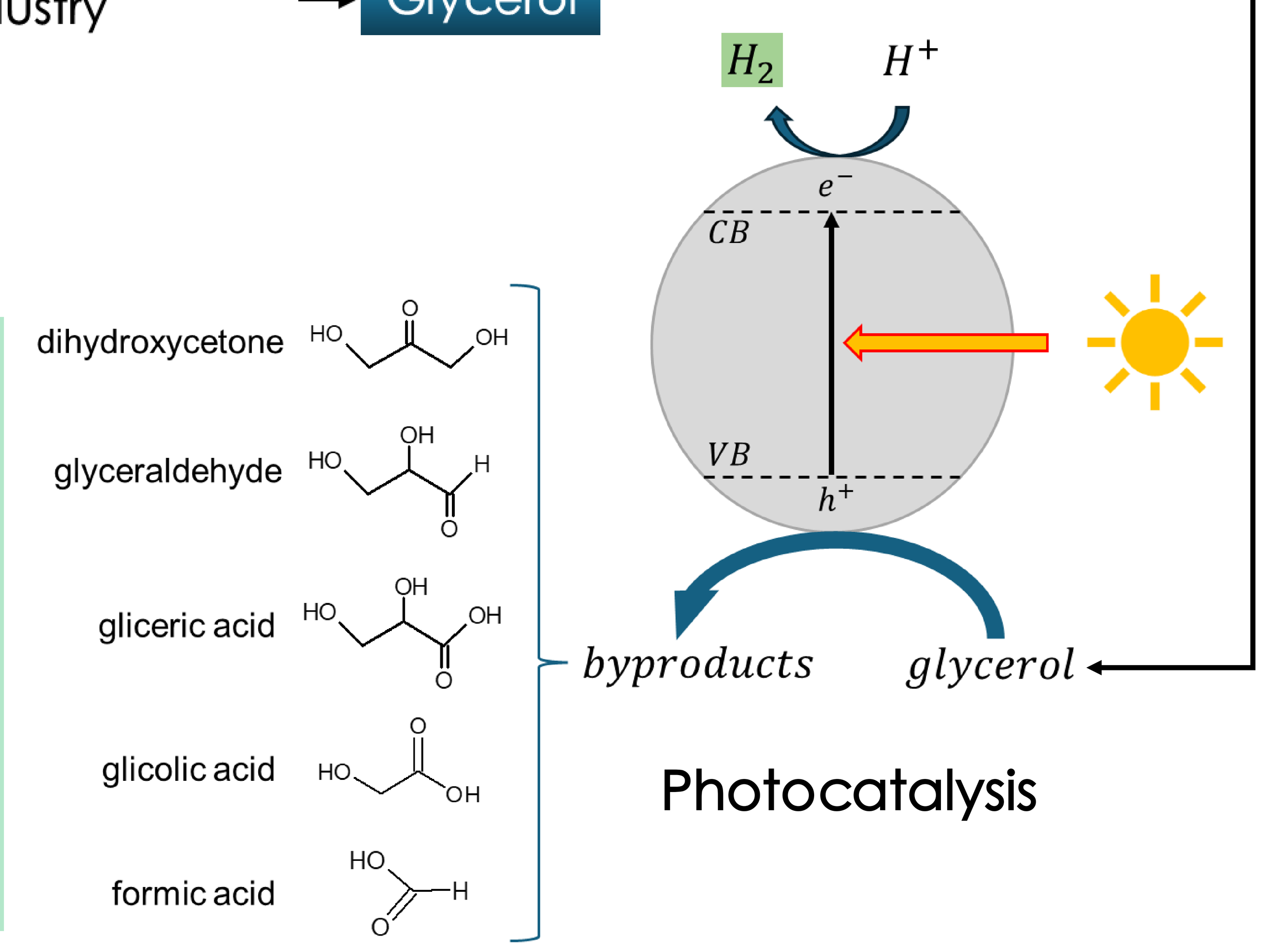
INTRODUCTION



High global demand for biodiesel is causing an oversupply of glycerol, promoting the exploration of new valorization approaches, such as photocatalysis

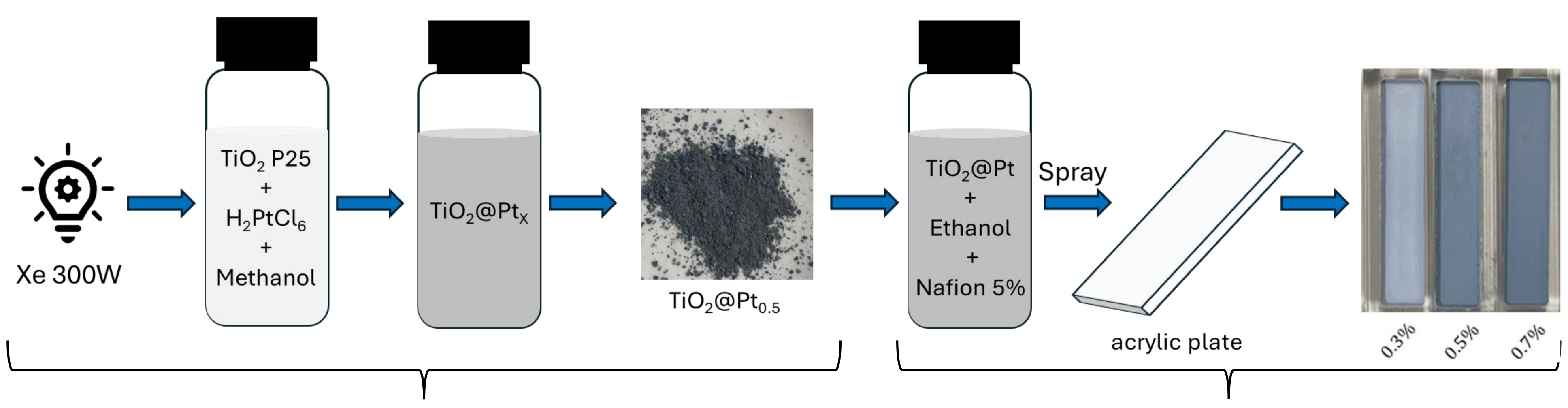


Advantages of use of photocatalytic reforming of glycerol:

- High yield of H_2
- Low cost of raw glycerol
- High solubility in water
- High added value byproducts

EXPERIMENTAL

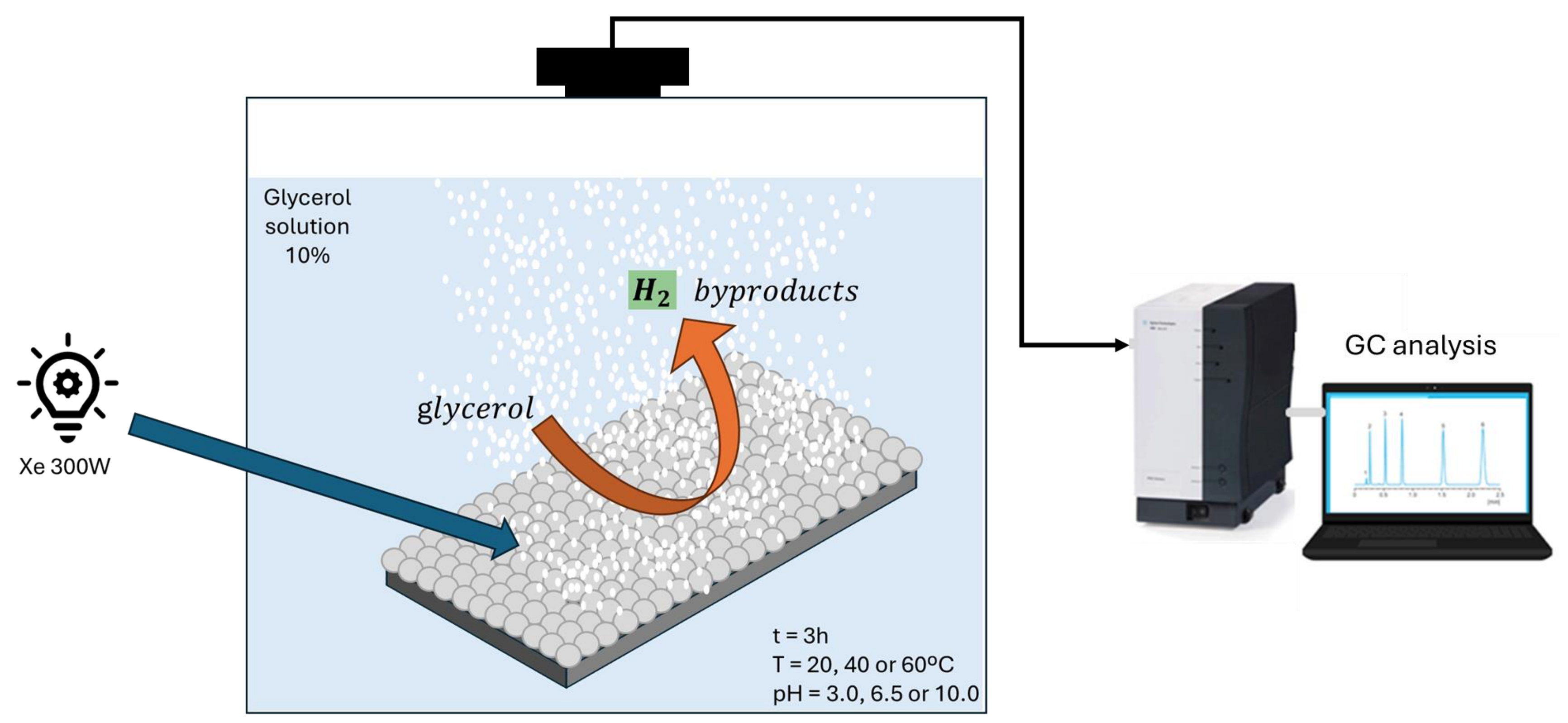
Synthesis of photocatalyst and immobilization on glass plate



Photodeposition of Pt on TiO_2
$TiO_2@Pt_X$ (x = 0.3, 0.5, 0.7%)

Immobilization of $TiO_2@Pt$ on plates
5 mg/cm²

Photocatalytic reaction



RESULTS

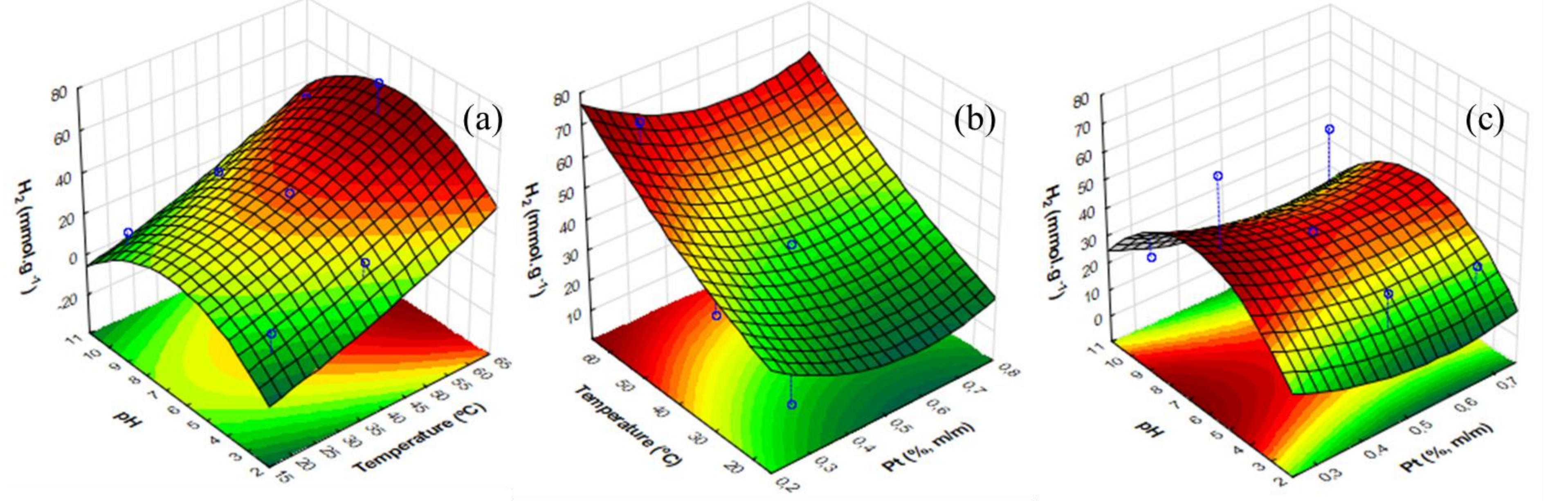


Fig. 1. Response surface of photocatalytic H_2 production. Glycerol: 10% (v/v). Catalyst: 0.4 g/L. t = 3h.

Photocatalytic performance

Evaluation of the variables of the photocatalytic process in the H_2 production

Pt (%, m/m)	Temperature (ºC)	pH	H_2 (mmol.g^{-1})
0.3	20	3.0	11.82
0.3	40	10.0	23.63
0.3	60	6.5	69.90
0.5	20	10.0	13.13
0.5	40	6.5	35.45
0.5	60	3.0	30.86
0.7	20	6.5	13.79
0.7	40	3.0	24.95
0.7	60	10.0	42.02

Glycerol: 10% (v/v). Catalyst: 0.4 g/L. t = 3h.

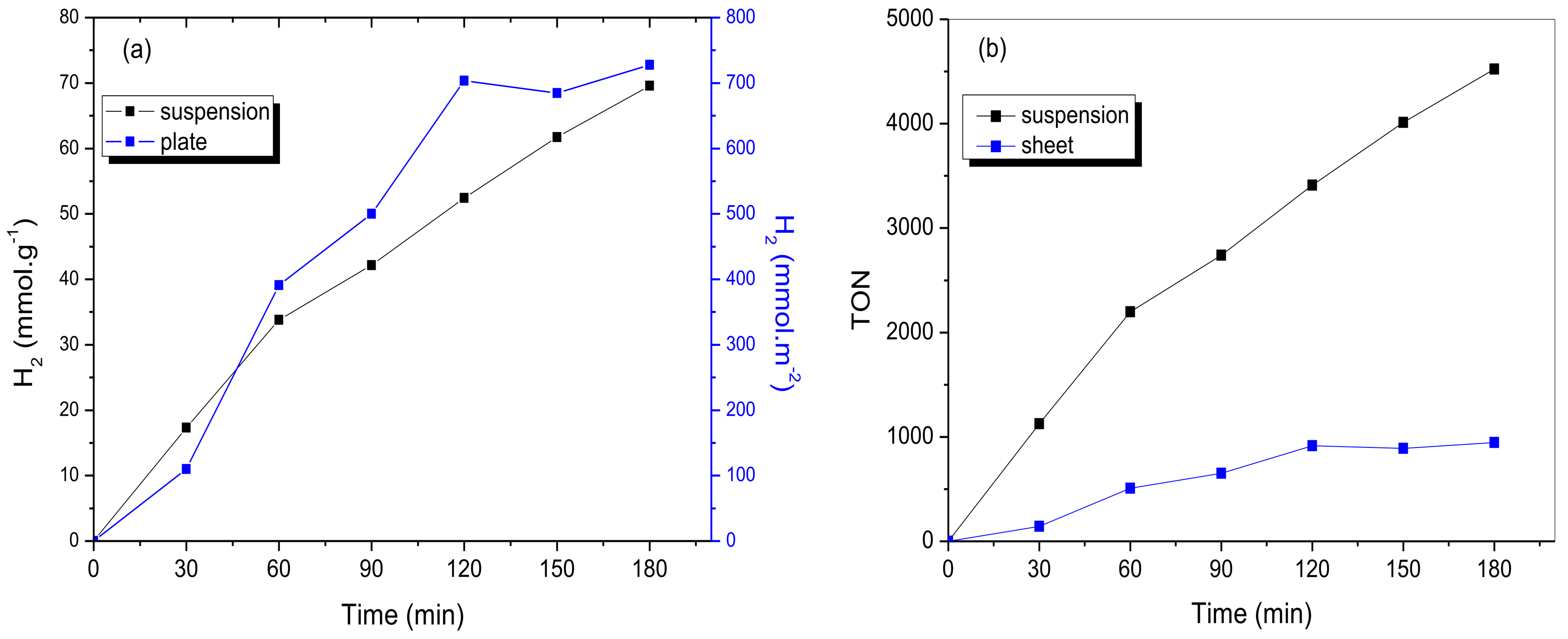


Fig. 2. **(a)** Profile of photocatalytic hydrogen production and **(b)** TON, with application of the catalyst in suspension and immobilized on a plate. Glycerol: 10% (v/v), Pt = 0.3% (m/m), temperature: 60ºC.

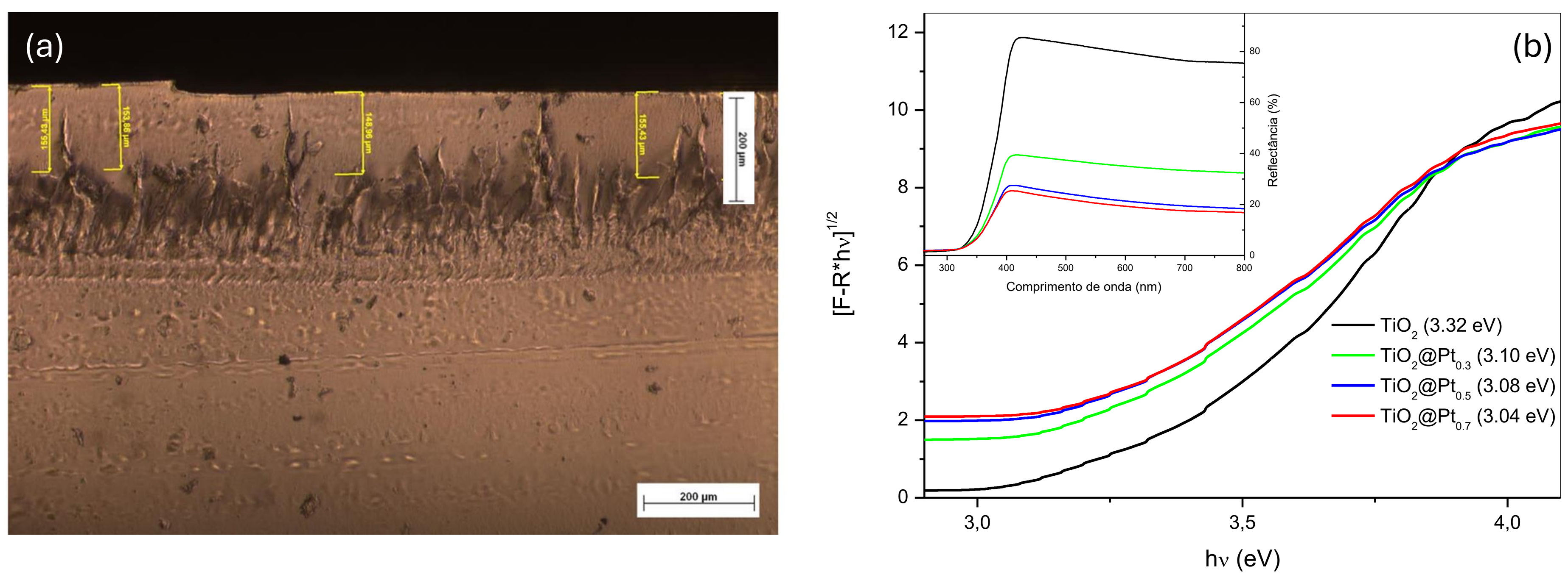


Fig. 3. **(a)** Microscopy image of thickness and **(b)** diffuse reflectance profiles of $TiO_2@Pt_X$ catalysts (x = 0.3, 0.5 and 0.7%)

CONCLUSIONS

The optimization of process variables revealed that temperature was the most relevant factor for hydrogen production. Furthermore, it was observed that a pH condition close to neutrality was favorable to the photocatalytic process

The catalysts in suspension and immobilized on plates showed similar results. However, the catalyst dispersed in powder demonstrated a more constant and continuous production profile.

The results suggest that immobilizing the catalyst on plates can provide a scalable solution for the photocatalytic process, minimizing costs and time associated with applying the catalyst in powder form.

ACKNOWLEDGMENTS

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