PHOTOCATALYTIC HYDROGEN PRODUCTION BY WATER-SPLITTING USING rGO-CdS NANOHYBRIDS

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INTRODUCTION

Under the pressure of a sustained increase in energy demand and a day-by-day intensified environmental concern, national and supranational policies encourage research focused on producing clean and renewable energy aimed to substitute fossil fuels. One of the most promising approaches is solar energy capture and its storage as molecular hydrogen (H_2), a clean fuel, which is directly generated from water and solar light energy, a process known as photocatalytic water splitting [1]. In photocatalysis, graphene and derivatives have shown an important role as co-catalyst owing to their high surface area and electrical properties. Thus, graphene-like materials, conveniently hybridized with inorganic semiconductors, can improve the semiconductor properties which are responsible of visible light absorption. Nevertheless, crystallinity of the semiconductors and its contact with the graphene materials are key factors influencing performance of the hybrid catalyst.

RESULTS AND DISCUSSION

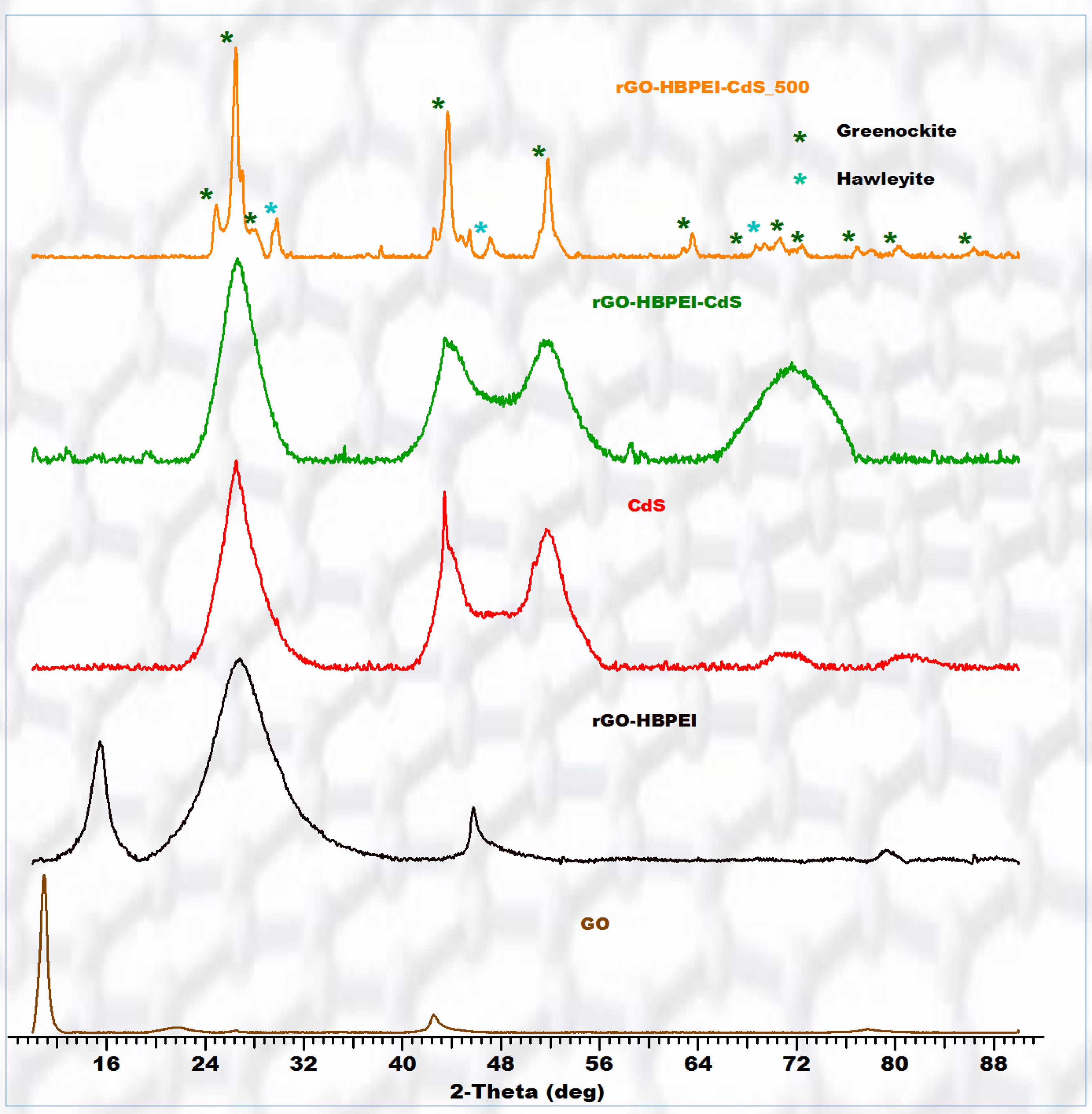

Figure 1. Crystallinity evolution by XRD of photocatalysts used.

- Using XRD it was possible to verify that the GO was reduced in the synthesis stage, showing, at the same time, the interplanar distance caused by HBPEI on rGO. Moreover, it was possible to observe the low crystallinity of CdS synthetized that was grafted to our hybrid (rGO-HBPEI) with success, which was called rGO-HBPEI-CdS.
- Knowing the importance of rGO-HBPEI-CdS crystallinity, it was annealed at 500 degrees to observe the crystalline change, which was remarkable.

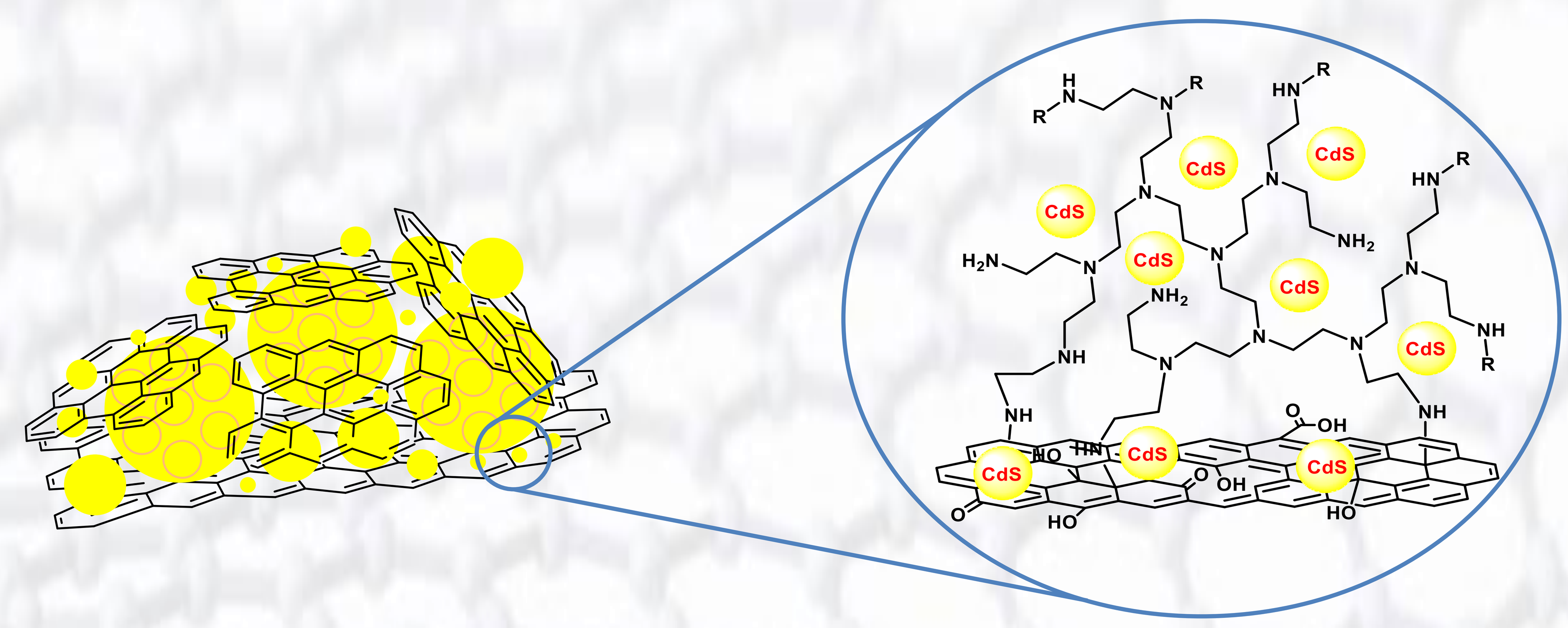

Figure 2. Hybrid materials synthesized from rGO-HBPEI and CdS

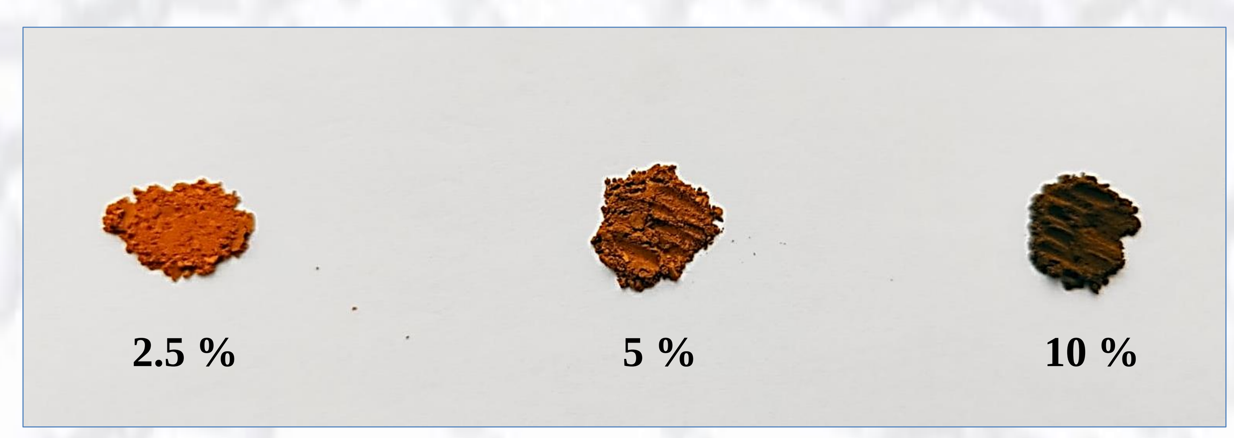

Figure 3. CdS photocatalyst with 2,5%, 5% and 10% of rGO-HBPEI.

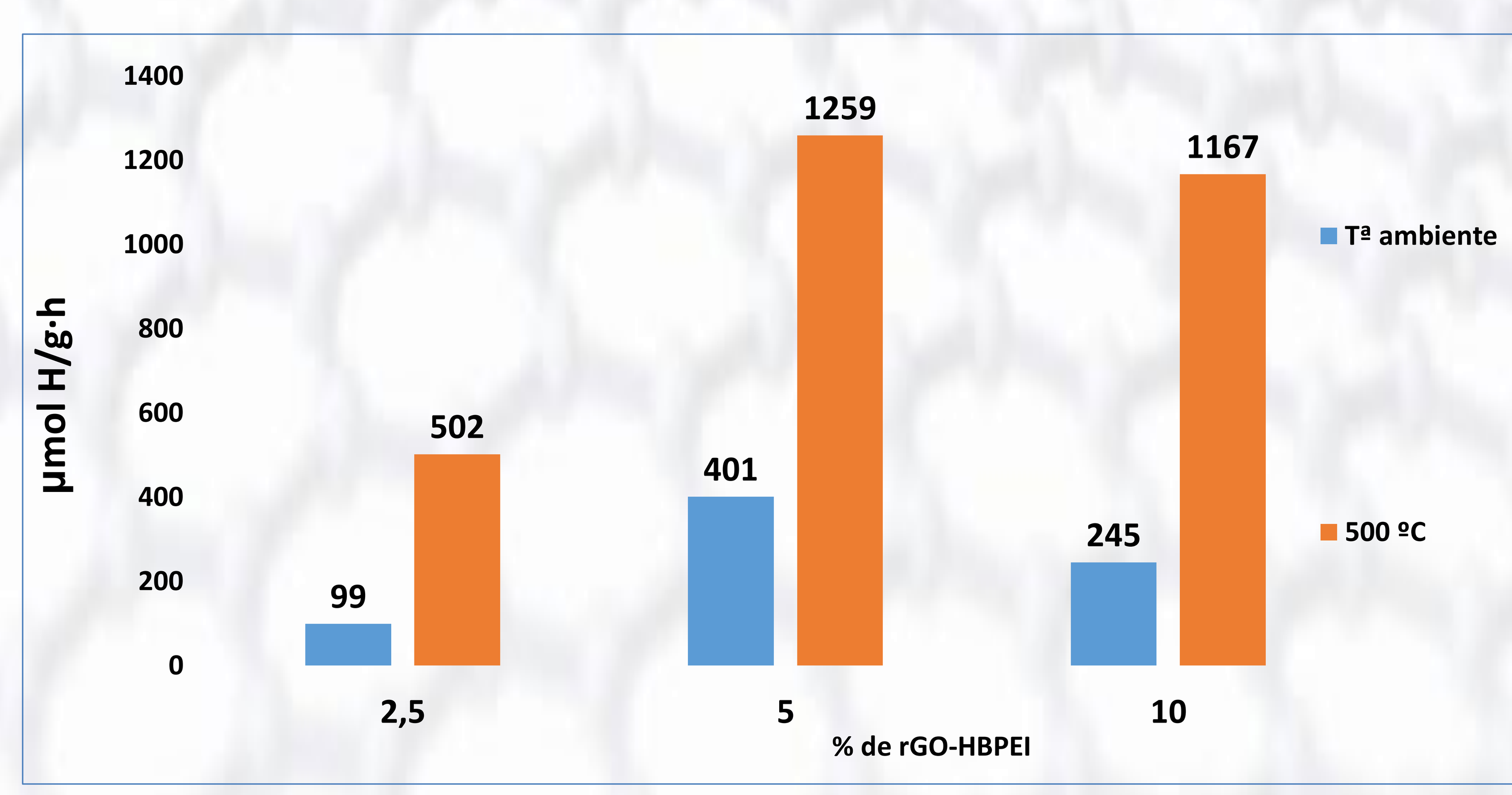

Figure 4. Temperature influence in the hydrogen production by photocatalysis

- Three types of CdS photocatalysts were prepared on three different percentages of rGO-HBPEI hybrid. Note that with 5% of this hybrid, best results were obtained.
- The best photocatalytic hydrogen production was achieved after being annealed at 500 ºC.

CONCLUSIONS

In conclusion, by using rGO-HBPEI hybrids (5%) an improvement of photocatalytic hydrogen production was achieved. By thermic treatment, an increase of hydrogen production was reached, which was associated to the best hybrid materials crystallinity.

REFERENCES

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2. S. Tongming, S. Qian, Q. Zuzeng, G. Zhanhu, W. Zili. ACS Catal., 8, 2253-2276 (2018).

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