Solar Photothermocatalytic CO_2 conversion on Co-Cu/Brookite TiO_2-CeO_2 catalysts

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The artificial photosynthesis, which involves water splitting and CO_2 reduction processes, is a fascinating route for a sustainable solar fuels production[1]. To increase the low conversion efficiency of this process, the multi-catalytic approach based on the synergism between thermo and photo-catalysis is a promising route. Semiconductors and in particular TiO_2 are workhorses for the CO_2 photoreduction, and in the last years different methodologies were proposed to increase its photoactivity[2]. In this work, the combination of the photocatalytic features of the brookite TiO_2 (a not much investigated TiO_2 crystalline form) and the redox properties of CeO_2 (one of the most used support in the thermocatalytic applications) were studied together with the interaction between this peculiar TiO_2-CeO_2 composite and a Co-Cu metal oxides alloy. The Co species acted as holes traps increasing the charge carriers separation and the addition of copper allowed to increase the number of oxygen vacancies in the TiO_2-CeO_2 composite. As a result, the bimetallic sample showed the best yield for CO and CH_4 production (**Fig. 1A**). Moreover, in the photothermo catalytic tests, the CO and the CH_4 production was increased to about 3 times compared to the tests carried out at room temperature (**Fig. 1B**). The solar driven-photothermo catalytic CO_2 reduction with semiconductor composites is a charming strategy to obtain green solar fuels with an environmental friendly utilization of carbon dioxide.

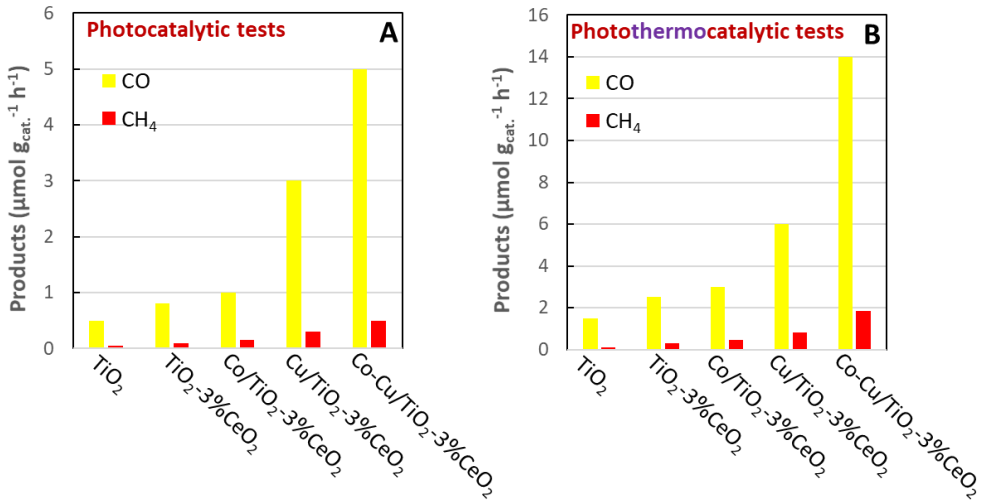

Fig. 1. *(A) Solar photocatalytic CO_2 reduction at room temperature, (B) Photothermo catalytic tests at T =120°C.*

Riferimenti

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2. Al Jitan, S.; Palmisano, G.; Garlisi, C. *Catalysts* **2020**, *10*, 227.