

ENERGYPOLIS SEMINAR

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Structure-dependent catalysis of solid surfaces

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Semiconductor photocatalysis has been developed to be one of most promising strategy for the environmental remediation and clean energy supply [1,2]. Understanding and manipulation of the reactivity of the semiconductors are the critical issues in this strategy. This talk will focus on the relationships between structure and reactivity from both experimental and theoretical aspects.

BiOCl single-crystalline nanosheets were synthesized with exposure of (001) and (010) surfaces. The characteristically layered structure led to distinct photoreactivity of these two surfaces in photodegradation under UV and visible light excitations [3]. Molecular oxygen activations, the key procedures of the photodegradation, were surface structure-dependent. Specifically, the activation processes were cogoverned by the atomic terminations and the surface oxygen vacancies, resulting the dominant production of $\cdot\text{O}_2^-$ from the one-electron reduction of O_2 on (001) surface, while the favorable formation of O_2^{2-} via two-electron transfer on (010) surface [4].

Apart from mastering the processes of molecular oxygen activation to control the surface reactions, the band structures of semiconductors were tuned to enhance the visible light adsorptions. Through self- or heteroatom doping, the optimized BiOCl, Bi_2WO_6 , TiO_2 , ZnO, and C_3N_4 possessed not only better visible adsorption, but also improved photoreactivity for hydrogen evolution [5-7].

References:

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Born 4. October 1988 in Wuhan, China, Kun Zhao graduated in Chemistry and Physics in Central China Normal University (2012). From 2012 to 2015 she carried out her master work at the same university in the field of photocatalysis. After graduated, she studied as an intern in Laboratory of Nanostructures at Surface (LNS), EPFL, working on catalysis of substrate-supported clusters utilizing STM.