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**Polar surface domains and their impact on photochemical reactivity**

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Polar semiconductors have recently received significant attention for applications as photocatalysts. Fields arising from surface charges separate photogenerated electron-hole pairs, reduce recombination, and increase the reactivity of the catalyst. Domains of opposite polarization in ferroelectrics create unbalanced charge in spatially localized areas where the domains intersect the surface. As a result, electrons are attracted to positively terminated domains where they promote reduction reactions and holes are attracted to negatively charged domains where they promote oxidation. The reactivities of materials developed using this principle, including heterostructures and core-shell materials, will be described. More recently, we have found that polar surface domains can be also be created on the surfaces of non-polar materials, including  $\text{SrTiO}_3$  and  $\text{BiVO}_4$ . In the case of  $\text{BiVO}_4$ , polarity arises from strain gradients created by ferroelastic domains. In the case of  $\text{SrTiO}_3$ , polarity arises from polar terminations on different terraces, which can be controlled by the annealing environment. In this talk, we will describe photochemical reactions on the surfaces of materials with polar domains and discuss opportunities of to control the domain structure to match the surface domain structure with the relative rates of oxidation and reduction reactions.