Tailoring the perovskite interface for photocatalytic applications

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Metal halide perovskites (MHPs) semiconductors possess unique optoelectronic properties, such as high optical absorption in the visible region, tunable band-gap and long carrier lifetime, high carrier mobility, which have been extensively exploited in photovoltaics and optoelectronic applications. More recently there has been a growing interests towards novel applications of MHPs, in particular in the field of solar-driven photocatalysis. Despite their high potential for such applications, perovskite generally suffer of low stability in polar solvents, that somehow hinder their activity as photocatalyst. Furthermore, since the photocatalytic sites generally lay on the surface, it is useful to tailor perovskite surfaces to maximize both their stability and activity towards the desired reaction. We propose different approaches to modify the perovskite surface for this purpose, also coupling it with a co-catalyst that can enhance the photocatalytic activity. We will also discuss how optical spectroscopies can be an efficient too to monitor the photoinduced processed occurring at the interface of perovskite materials with target molecule and/or partnering catalytic materials, allowing the correlation with photocatalytic performances. This correlation is strongly supported by the modeling of the active interfaces of such systems.