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# ****Magnetically Tailored Metal Oxide Thin Films as Efficient Catalysts for Green H₂ and NH₃ Synthesis****

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Thin films of semiconductor oxides offer tunable electronic properties and high surface-area interfaces, making them ideal platforms for efficient small molecule activation in green hydrogen and ammonia production. The growing possibilities of engineering nanostructures in various compositions (pure, doped, composites, heterostructures) and forms has intensified the research on the integration of different functional material units in a single architecture to obtain new photo- and electrocatalytic materials. We report here on the influence of external magnetic fields applied parallel or perpendicular to the substrate during plasma enhanced chemical vapor deposition of transition metal oxides. Films grown from transition metal precursors showed pronounced changes in crystallographic textures depending upon whether CVD was performed with or without external magnetic field. Investigations on the water splitting properties of the hematite films in a photoelectrochemical reactor revealed superior photocurrent values of hematite photoanodes deposited in external magnetic field. This talk will demonstrate that applying magnetic fields during growth of thin films can fundamentally reconfigure lattice characteristics. This is manifested in the alteration of their crystallographic structure and the topology of the surface states. This dual modulation precisely tailors their intrinsic and emergent electrochemical properties. The MF-CVD approach establishes a groundbreaking and versatile strategy to transform functional materials at the atomic level.