# Fine-tuning bimetallic nanostructures for enhanced hydrogen evolution reaction

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Water electrolysis, powered by electricity obtained from renewable sources, emerges as a pivotal method for green hydrogen production, a crucial energy vector. However, its widespread adoption faces challenges due to high energy consumption and resultant high costs attributed to the substantial overpotential of electrochemical reactions, specifically cathodic hydrogen evolution (HER) and anodic oxygen evolution (OER) reactions [1].

In this study, we introduce a novel electrocatalyst for HER, comprising RuIr nanoparticles supported on nitrogen-doped titanium oxide integrated into reduced graphene oxide (RuIr/TiON-C). The electrochemical activity and stability of RuIr/TiON-C are thoroughly examined in both alkaline and acidic environments and compared to RuIr/C analog as well as Ru/C, Ir/C, and Pt/C benchmarks. In alkaline electrolyte, RuIr/TiON-C outperforms all other tested materials whereas in acidic media it performs similarly to Pt/C, the current leading catalyst for HER in acid. Furthermore, RuIr/TiON-C demonstrate robust HER performance during potentiodynamic and potentiostatic degradation tests. The enhanced HER activity and stability of the investigated material can be linked to two effects: alloying of Ru and Ir and strong metal metal-support interaction (SMSI) triggered between the TiONx support and RuIr nanoparticles. The synergy of these two factors results in increased catalytic activity for the hydrogen evolution reaction.

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References

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