Title: **A literature analysis about the performance and stability of platinum-free catalysts for the oxygen reduction reaction in polymer electrolyte fuel cells**

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Due to CO_2 emissions and environmental pollution caused by fossil fuels, there has been an increasing need for a transition towards renewable energies. The energy based on cold hydrogen combustion in fuel cells is clean, as the combustion product with oxygen (from the air) is water. It is also cleaner than chemical combustion, due to the high temperatures of the later, which may produce NO_x in the presence of air. Furthermore, fuel cell efficiency doubles that of the combustion (heat) engines. Proton exchange membrane fuel cells (PEMFCs) are the most appropriate fuel cells for vehicles because they offer the best power and energy densities. Almost every vehicle manufacturer has designed their own prototypes powered by fuel cells, proving their viability. However, the main concern with PEMFC is the cost and scarcity of platinum, catalyst used for the oxygen oxidation reaction (ORR), responsible of about 55% of the total cost. It would also be impossible to power every combustion engine vehicle on the planet with PEMFC, as there is not enough metal available. Several Pt-free catalysts do exist, both metal-based and metal-free, and they are a more affordable alternative, though their efficiency is still in development. Currently, metal-free heteroatom-doped carbon-based electrocatalysts show the best catalytic activity in acidic medium, but further research is needed to prove its efficiency outside an experimental environment.