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**The spin generated from ferromagnetism and anti-ferromagnetism conditions as the origin of the catalytic activity of oxygen reduction reaction**

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Platinum and Pt alloys are known to be the best catalyst for oxygen reduction reaction (ORR). In the presence of precious and expensive Pt and Pt alloys the ORR is still not very efficient (sluggish). This means that it is very important to find alternative non-precious metal which is cheaper and more efficient than precious platinum. The ORR is the cathode-anode reaction in fuel cells that runs hydrogen powered vehicles and in water splitting reaction to hydrogen and oxygen. Hydrogen is considered the optimum future green fuel. It is well known that alloying Pt with Fe, Co or Ni increase the rate oxygen reduction reaction (ORR). However,

the origin of this effect still remains elusive. The purpose of this abstract is to show that under the effect of spin Seebeck effect (induced thermal gradients) the increase of the spin current of the conduction electrons of the platinum when joined with ferromagnetic materials (Fe, Co or Ni) may be responsible for such catalytic activity. Thus, this suggest that antiferromagnets materials exposed to thermal gradients such as for example PtMn or Cr which can generate extremely higher spin current can be a possible replacement for Pt.

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