The use of fossil fuels has started a climate change connected to risks such as extreme heatwaves, rising sea level, extinction of species and other catastrophes. That's why it's necessary to move to carbon neutral economics. Hydrogen fueled proton exchange membrane fuel cells (PEMFCs) can power vehicles without emitting dangerous emissions. The main obstacle to their widespread use resides on its cathode side where a sluggish oxygen reduction reaction takes place. Because of that, PEMFC cathodes require large amount of expensive platinum catalyst which moreover operates under aggressive corrosive environment. This thesis explores the possibilities of replacing platinum with a bimetallic alloy of platinum and a cheaper metal.

Pt–Co, Pt–Cu and Pt–Y bimetallic catalysts of different compositions ($Pt_{75}M_{25}$, $Pt_{50}M_{50}$ and $Pt_{25}M_{75}$) were prepared by magnetron sputtering. The catalysts were thoroughly characterized and their activity and stability were tested. The results show that replacing platinum with a bimetallic alloy can significantly increase the specific power activity of the cathode catalyst in PEMFC. On the other hand, bimetallic catalysts, especially those with lower amount of Pt, are more prone to degradation. Nevertheless, bimetallic catalysts with $Pt_{75}M_{25}$ composition showed a promising activity-stability combination.