Abstract: The production of hydrogen by water electrolysis requires an efficient and abundant electrocatalyst. Recently, transition metal carbides have appeared as promising candidates to substitute Pt-group metals as catalysts for the hydrogen evolution reaction (HER) [1,2]. In this work, platinum-modified transition metal-doped (Co, Ni and Cu) Molybdenum carbide (TM-Mo$_2$C) particles were investigated as catalysts for the HER in alkaline medium (0.1 M NaOH). For this, the materials have been prepared by a temperature programmed reduction method. Produced materials were characterized by X-Ray diffraction (XRD), Scanning (SEM) and Transmission (TEM) Electron Microscopy, Energy Dispersive X-Ray (EDX) analysis and Cyclic Voltammetry (CV).

XRD data evidenced that the major crystalline phase in all TM-Mo$_2$C catalysts is the stable hexagonal $\alpha$-Mo$_2$C, together with nano-crystalline transition metal particles, ~40-50 nm. Results show a high activity toward the HER for all TM-Mo$_2$C catalysts, higher than the corresponding activity of the doping transition metal [3]. This suggests them as promising non-precious electrocatalysts for this reaction under alkaline conditions. However, similar to what has been found in acid media, there is a decrease in the HER activity upon metal doping, following an activity trend of $\alpha$-Mo$_2$C $>$ Co-Mo$_2$C $>$ Ni-Mo$_2$C $>$ Cu-Mo$_2$C. Contrary to acid media, CV results revealed an important loss in the catalyst's activities after 1000 cycles between -0.2 to 0.4 V.

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