

Water Oxidation Catalysis by Molybdenum-doped Manganese OxideE. Balaghi¹, G. R. Patzke^{1*}¹Department of Chemistry, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland

Designing a high efficient, cheap and green water oxidation catalyst (WOC) is one of the most important challenges in the sustainable energy field. The CaMn_4O_5 cluster in nature's photosystem II catalyzes photosynthetic splitting of water into oxygen and protons.¹ Therefore, many researchers focus on modelling this metalloenzyme center by metal complexes with different ligands, as well as through various metal oxides.² According to undeniable role of manganese in the natural water oxidation reaction, manganese oxides are promising as environmentally friendly catalysts.² Their optimization is a sustainable way to robust materials for applications. In this work, molybdenum doped manganese oxide was synthesized and characterized by PXRD, XPS, TGA, FT-IR, Raman, BET, SEM, and HRTEM. In addition, the catalytic activity of doped molybdenum manganese oxide in chemical, photochemical and electrochemical water oxidation reactions are investigated. Results show that molybdenum has a significant effect on the chemical activity of manganese oxide in ceria solution. The water oxidation experiment under the photochemical conditions with Mo doped $\text{Mn}_2\text{O}_3/[\text{Ru}(\text{bpy})_3]^{2+}/\text{S}_2\text{O}_8^{2-}$ also led to promising results (TOF $\sim 0.83 \mu\text{mol O}_2 \cdot \text{m}^{-2} \cdot \text{s}^{-1}$).

[1] Yasufumi Umena, Kawakami Keisuke, et al. *Nature*, **2011**, 473, 55-60.

[2] Mohammad Mahdi Najafpour, Renger Gernot, et al. *Chem. Rev.*, **2016** 116, 2886-2936.