Abstract

Molybdenum oxide based catalysts is prepared by precipitation method. The influence of preparation variables of temperature, acid concentration and molybdenum concentration on the structure of molybdenum oxide is investigated by Powder X-ray Diffraction, Raman Spectroscopy, Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM). The combination of Powder XRD and Raman Spectroscopy was used to identify the phase and the structure of the fresh precipitate. TEM and SEM are applied as a supplement to get a better understanding of the structure and morphology of the molybdenum oxide obtained. The current preparation routine for MoVTeNb Oxides defect introduction is the incorporation with foreign atoms although the high chemical complexity of such systems makes understanding and control of catalyst formation extremely difficult. An alternative way is to reduce the chemical complexity by maintaining the same high structural complexity by preparing Molybdenum Oxide alone. Nanotechnology is a suitable tool for making specific oligo anions by carefully connecting MoO_6 octahedra. Four types of cation used were found to be clearly influencing the phase and structure obtained by looking at the size of the series $Li^+ < Na^+ < K^+ < NH_4^+$. Ammonium as counter-ion produced supramolecular $Mo_{36}O_{112}^{4-}$ and hexagonal MoO_3 while potassium yielded supramolecular $Mo_{36}O_{112}^{4-}$, hexagonal MoO_3, and additional phase trimolybdate. Both sodium and lithium resulted in hexagonal MoO_3 and orthorhombic MoO_3 respectively.

ACKNOWLEDGEMENT

In the name of Allah, Most Gracious and Most Merciful…

Deepest thanks especially to my supervisor:

Assoc Prof Dr Sharifah Bee Abd Hamid

for giving me an opportunity to be one of her students even though I was from a different field (Biochemistry) during my degree and also for her advices, encouragement, support and discussion for me to complete my dissertation for approximately 2 years.

Special thanks to my second supervisor:

Prof Robert Schlögl

for his continuous discussion and supports during my work in Fritz Haber Institute of Max Planck Society in Berlin, Germany.

Warmest thanks to Dr Dirk Niemeyer (head of preparation group), Stefan Knobl (expert phD student) under Prof Schlögl, Dr Frank Girgsdies (very expert XRD guy), and Dr Olaf Timpe from Fritz Haber Institute for their valuable discussion and guidance through my days in Fritz Haber Institute. Thanks too to my Malaysian colleagues, Norli Abdullah, and Qureshiah Begum Abd Basher who were responsible for their contribution in part of my thesis.

Not forgotten, Gisela Weinberg for SEM, Dr Jacob Wagner for TEM, Edith Kitzellman for XRD measurement, and Gisela Lorentz for helping me in the lab.

My warmest feeling to my beloved family, my father (abah), my mother (mak), sisters (eni and ayang), brothers (firdaus and epoi), my brother in law (Sani), my fiance (Rosli), for their love, encouragement and support during my journey to complete my dissertation. Special to my father (abah), thank you so much for your pray, support, understanding, encouragement, advices, and worries especially while I was abroad in Germany, thousand kilometers away from Malaysia.

Many thanks to MOSTI for their financial support (IRPA RM8 33-02-03-3010). Last but not least, thanks to my group (Petrochemical) for their help and support while I was in COMBICAT, University Malaya.