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Characterization and Electrolysis of Zn and Cu 2,6-diacetylpyridine bis(2-hydrazinopyridine)

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1. Curry et al. Metal complexes derived from substituted hydrazones of 2,6-diacetylpyridine. Inorg. Chem., 1967, 8, 1570-1574 2. Wu et al. Non-noble metal electrocatalysts for the hydrogen evolution reaction in water electrolysis. Electrochemical Energy Reviews, 2021, 4, 473-507 3. Midilli, A., et.al., On hydrogen and hydrogen energy strategies: I: current status and needs. Renew. Sust. Energ. Rev. 2005, 9, 255-271 4. Abe, J. O. et. al. Hydrogen energy, economy and storage: Review and recommendation. Int. J. Hydrogen Energy 2019, 44, 15072-15086. 5. Cronin, S.P., et al. Utilizing Charge Effects and Minimizing Intramolecular Proton Rearrangement to Improve the Overpotential of a Thiosemicarbazonato Zinc HER Catalyst. Inorg. Chem. 2019, 58, 12986-12997.

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ABSTRACT

With increasing demands for fuel and concerns over climate change, the search for sustainable energy sources is ever growing. Hydrogen is a potential solution to these issues, as it is clean, recyclable, and efficient. However, hydrogen must be generated, unlike other fuel sources that are naturally ready for use. The most sustainable method for hydrogen production involves water electrolysis, as no pollution is generated. The water splitting process contains a cathodic hydrogen evolution reaction (HER) and an anodic oxygen evolution reaction (OER). These reactions require a catalyst to overcome the kinetic barrier present and meet the high voltage requirements for driving the electrolysis reaction. Platinum based catalysts are the most effective in these reactions, but the scarcity and high prices of platinum materials make it undesirable for use. Exploration of still efficient but more sustainable electrocatalysts has intensified to replace the expensive and scare platinum materials. The Grapperhaus group has worked on redox non-innocent ligands with abundant, first-row metals to create an inexpensive catalyst for HER. The redox non-innocent ligand acts to confer nobility onto the first-row metals allowing them to do two electron chemistry which is required for HER. Herein, we describe the characterization and electrocatalytic ability of Zn and Cu 2,6- diacetylpyridine bis(2-hydrazinopyridine) in methanol with triethylammonium hexafluorophosphate.

1. Curry et al. Metal complexes derived from substituted hydrazones of 2,6-diacetylpyridine. Inorg. Chem., 1967, 8, 1570-15742. Wu et al. Non-noble metal electrocatalysts for the hydrogen evolution reaction in water electrolysis. Electrochemical Energy Reviews, 2021, 4, 473-5073. Midilli, A., et.al., On hydrogen and hydrogen energy strategies: I: current status and needs. Renew. Sust. Energ. Rev. 2005, 9, 255-2714. Abe, J. O. et. al. Hydrogen energy, economy and storage: Review and recommendation. Int. J. Hydrogen Energy 2019, 44, 15072-15086.5. Cronin, S.P., et al. Utilizing Charge Effects and Minimizing Intramolecular Proton Rearrangement to Improve the Overpotential of a Thiosemicarbazonato Zinc HER Catalyst. Inorg. Chem. 2019, 58, 12986-12997.