

Development of new cobalt (II) complexes based on hexadentate polypyridyl ligands for photochemical hydrogen production

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The global increase in energy consumption and the detrimental effects of the rising concentration of atmospheric carbon dioxide on Earth's climate are main drivers for searching of new alternative energy provisions. In addition, the geopolitical issues related to fossil fuels as well as the consequences of air pollution due to their combustion on the environment and human health must be addressed as soon as possible.

Given those problems, efficient and stable technologies for the use of sustainable and clean energy sources are of utmost importance. Along these lines, water splitting in a photocatalytic manner is a promising way to produce highly energetic hydrogen from solar energy.

As a carbon free fuel, molecular hydrogen has been described as a sound alternative compared to more traditional fossil energy carriers because it is convertible into liquid fuels by means of established industrial processes. Basically, hydrogen is environmentally-friendly because water is the only oxidation product. The conversion of solar energy to chemical energy through photocatalytic processes constitutes a highly promising strategy beside alternative sustainable solutions such as biofuels.

The aim of my master thesis was to explore the synthesis of polypyridyl ligands and the subsequent complexes they formed with cobalt (II) salts. Cobalt salts and their complexes could be used for water splitting and demonstrated the ability to catalyze the production of hydrogen gas from hydrogen ions in the right conditions. Especially interesting were three different unusual heptacoordinated cobalt complexes, which were synthesized in this project, some of which produced hydrogen when irradiated with visible light.

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