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Multi ferrocenyl dithiophosphonate transition metal complexes as potential high efficiency co-sensitizer in dye-sensitized solar cells

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This work presents an overview of the reaction of 2, 4-diferrocenyl-1, 3-dithiadiphosphetane-2, 4-disulfide (Ferrocenyl Lawesson's reagent) with water to produce the non-symmetric, ferrocenyl dithiophosphonic acid respectively in high yields. These acids were readily deprotonated by anhydrous ammonia to yield the corresponding ammonium salt $\text{NH}_4\text{S}_2\text{PFcOH}$. These were complex to Ni (II) in molar ratio 1:1 and 1:2. The resulting complex from the reaction formed same compound with different isomers (Cis and Trans) and also compound with multimetallic coordination. Quality x-ray crystals were formed from THF/Ether. The compounds were characterized by ^1H , ^{31}P NMR and FTIR. Bulk purity were confirmed by either ESI-MS or elemental analysis and The XRD images were obtained using single crystal x-ray crystallographic studies. The electrochemical investigation of the compounds was carried out in full scale and the application to dye sensitized solar cell showed the compounds are potential co-sensitizers.

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