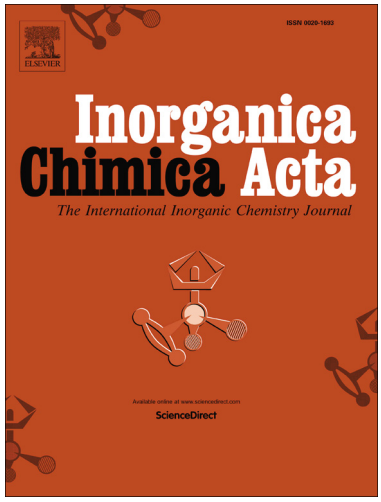

Research paper

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Performance improvement of Ru^{II} Complexes Pyridinyl Backbone on Dye-Sensitized Solar Cells (DSSC)

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Abstract

Two new series of Ru^{II} complexes (**6-10** bearing an imine bond and **16-20** bearing a sulfonamidate fragment) based 8-aminoquinoline backbone were prepared and characterized by NMR, FT-IR, elemental analysis, UV-vis, CV etc. and tested as a photoactive dye for dye-sensitized solar cells (DSSC).

The performance of the Ru^{II}-arene containing imine bond complex types (**6-10**) as a dye on DSSCs produced cells with power conversion efficiencies (PCEs) of around 0.03 – 0.10%. The [(*N*-Quinoline-8-yl-benzenesulfonamido)(*p*-cymene)chlororuthenium(II)] (**SD-E1311**) complex, which we previously produced was tested instead of the complexes bearing the imine bond (**6-10**) and its PCE for **SD-E1311** was found as 0.12%. Herein, the increase of the Voc is quite interesting and, for this reason, the sulfonamidate based complexes were selected for the backbone structure.

To enhance immobilization to the titanium oxide layer and solubility and electron injection of the corresponding excited dye on the DSSC process, 2,2'-bipyridine-4,4'-dicarboxylic acid as the anchor group and thiocyanate ligands were selected instead of *p*-cymene and chloro ligands over the sulfonamidate complex. Then, the photoactive dye properties of the new Ru^{II} complexes (**16-20**) were investigated and the results showed that the **16-20** dyes bearing sulfonamidate, carboxylic anchoring and thiocyanate fragments benefited the short-circuit current and the open-circuit voltage, and had PCEs of **1.26%, 1.08%, 1.58%, 0.90%** and **1.36%** under AM1.5G irradiation, respectively. The working devices, results also show that