**Povzetek**

Živimo v času, ko potreba po električni energiji neprestano narašča. Naša odvisnost od fosilnih goriv za njeno proizvodnjo ima velik vpliv na energijske rezerve in okolje. Zato je pomembno, da razvijamo nove načine proizvodnje električne energije, ki temeljijo na obnovljivih virih.

Grätzlove sončne celice predstavljajo cenovno ugodno alternativo proizvodnje energije, ki kot vir energije uporablja sončno svetlobo. Kljub slabšim izkoristkom, v primerjavi s klasičnimi silicijevimi sončnimi celicami, imajo najboljše razmerje med ceno in proizvedeno energijo.

Namen moje doktorske disertacije je bil poiskati način nanosa platinastega katalizatorja na plastične substrate, kar bi omogočilo proizvodnjo fleksibilnih Grätzlovih celic. Standardni način priprave katalizatorja vključuje termično redukcijo pri temperaturah nad 450 °C, česar plastični substrati ne zdržijo. V ta namen sem uporabil različne reducente, ki so temperaturo redukcije znižali na 100 °C.

Uporaba organskih reducentov, kot so mravljinčna kislina, etilen glikol ali propilen glikol, v plinastem stanju, mi je omogočila nanos enakomernih slojev platine. Tekoči reducenti med redukcijo pokvarijo nanesen sloj, saj se platinski prekurzor lahko ponovno raztopi, redukcija v raztopini pa povzroča aglomeracijo delcev in neenakomeren nanos.

Pripravljeni katalizatorji imajo dober oprijem, veliko aktivno površino ter dobre elektrokatalitske lastnosti. To sem dokazal z njihovo uporabo v testnih celicah, ki so dosegle izkoristek nad 5 %. Hkrati pa se je izkazalo, da lahko, s povečanjem količine nanesene platine, pripravimo kompaktne sloje, ki so električno prevodni in lahko služijo kot prevodni sloj in katalizator hkrati. S tem se izognemo uporabi dragih prevodnih slojev, kot je s kositrom dopiran indijev oksid.

**Ključne besede:** Grätzlove sončne celice, DSSC, Pt katalizator, nizkotemepraturna redukcija

**Abstract**

Mankind’s dependency on fossil fuels for energy production is taking a great toll on the planets energy reserves as well as the environment. In a world where the demand for energy is constantly growing it is therefore important to develop new methods for energy production that are based on renewable sources of power.

Grätzel solar cells represent a cheap and viable alternative that uses solar power to produce electricity. Even though the efficiency of such cells is lower than that of silicon based solar cells, they have the best cost to power production ratio to date.

The aim of my doctoral thesis was to develop a method that would allow for the deposition of platinum particles on plastic substrates and subsequently the fabrication of flexible Grätzel solar cells. The standard preparation of such catalysts requires thermal reduction of the platinum precursor at temperatures exceeding 450 °C which most plastic substrates can’t withstand. To overcome this problem I used reducing agents which lowered the reduction temperature to 100 °C.

The use of organic reducing agents such as formic acid, ethylene glycol or propylene glycol in gaseous form, has enabled me to deposit uniform layers of platinum nanoparticles on plastic substrates. Since the reducing agents are not in liquid form there is no movement or agglomeration of platinum particles during the reduction process.

The prepared catalysts had good adhesion to the surface, a high surface area and good electro catalytic properties. The prepared catalysts were evaluated in test solar cells that had 5 % efficiency. Furthermore, I discovered that by increasing the amount of deposited platinum, it is possible to obtain electrically conductive thin platinum layers that can serve both as the conductive layer as well as the catalyst, thereby eliminating the need for the expensive indium tin oxide conductive layer.

**Keywords:** Grätzel solar cells, DSSC, Pt catalyst, low temperature reduction