PMC-EF2a
(2.06.02)

U.S. DEPARTMENT OF ENERGY
EERE PROJECT MANAGEMENT CENTER
NEPA DETERMINATION

RECIPIENT: Rochester Institute of Technology **STATE:** NY

PROJECT TITLE : Hyperspectral Polymer Solar Cells

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
	DE-FG36-08GO88110	GFO-09-025-001	GO88110

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), I have made the following determination:

CX, EA, EIS APPENDIX AND NUMBER:
Description:

B3.6 Siting, construction (or modification), operation, and decommissioning of facilities for indoor bench-scale research projects and conventional laboratory operations (for example, preparation of chemical standards and sample analysis); small-scale research and development projects; and small-scale pilot projects (generally less than two years) conducted to verify a concept before demonstration actions. Construction (or modification) will be within or contiguous to an already developed area (where active utilities and currently used roads are readily accessible).

Rational for determination:

Rochester Institute of Technology (RIT) would demonstrate the feasibility of photo-voltaic polyurethane films. This project was previously funded with GFO-09-025 on November 26, 2008 with a CX3.6. Laboratory work would take place at the existing RIT laboratories in Rochester, New York. The project is divided into four tasks below:

Task 1.0:
Task 1.1: Analyze candidate NIR absorbing dyes (i.e. cyanine, phthalocyanine, benzoquinone) by cyclic voltammetry for energy level matching in the proposed device structure.
Task 1.2: Measure the cyclic voltammograms of the relevant dyes under dark/illuminated conditions and in combination with P3HT and MEH-PPV polymer blends.
Task 1.3: Measure the spectral response for devices prepared from dye-polymer composites with appropriate energy level matching to probe sub-gap response.
Task 1.4: Fabricate PCBM:Polymer devices in an inert processing environment with and without dyes and measure I-V curves.
Task 1.5: Optimize active layer composition including relative dye concentration and film thickness to maximize absorption and charge transport.
Task 1.6: Develop a more fundamental understanding of how processing conditions during deposition and annealing affects the active film properties.
Task 1.7: Develop tandem junction polymer solar cells using a visible absorbing polymer composite junction and NIR-enhanced polymer composite junction and a TiOx tunnel junction.
Task 1.8: Develop an extended range quadruple-source solar simulator which can accurately characterize improved spectral range polymer solar cells. This would require suitable filters and additional sources, IR and UV blue boosts, to be added a conventional simulator to more precisely match AM0.

Tasks 2.0:
Task 2.1: Investigate SWCNT replacement of ITO in MEH-PPV:PCBM and P3HT:PCBM devices.
Task 2.2: Investigate SWCNT replacement of tunnel junction in the previously demonstrated tandem designs.
Task 2.3: Develop a multijunction polymer (3 or more junctions) device using MEH PPV and/or P3HT devices and dyes.
Task 3.0:
The investigative approach combines laboratory experiments to test alternative (i.e., water-based) solvents, devices, materials, and production pathways, with process-flow modeling and life-cycle analysis. The result would be a comparative determination of eco-efficient organic solar cell device and fabrication process configurations, reported relative to crystalline silicon solar cell values available in the literature.
Task 3.1: Design a suite of device structure configurations representing potentially commercially viable technologies

that encompass a broad range of independent variables, including polymer types, NIR-absorbing molecules, and tunnel junction materials.
Task 3.2: Fabricate alternative, experimental devices at the laboratory scale, measure requisite material inputs, solvent and intermediary inputs, product yields and energy consumed.
Task 3.3: Test experimental devices to determine use-phase energy efficiency.
Task 3.4: Establish process-flow input-output models of competing fabrication pathways for experimental device structures.
Task 3.5: Expand process-level to life-cycle models using hybrid life-cycle assessment methods, such as a combination of SimaPro and economic input-output life-cycle analysis (EIOLCA).
Task 3.6: Conduct uncertainty and sensitivity testing to determine factors that most directly affect eco-efficiency.
Task 3.7: Determine likely eco-efficient device structures, fabrication pathways and solvents based upon E-factor (i.e., process input to final product ratio) and EROI criteria.
Task 3.8: Compare polymer solar cell life-cycle eco-efficiencies to those of single- and poly- crystalline silicon solar cells as reported in the literature.

Task 4.0:
PROJECT MANAGEMENT AND REPORTING
Reports and other deliverables would be provided in accordance with the Federal Assistance Reporting Checklist following the instructions included therein.

RIT claims no additional permits are needed and there would be no generation of air emissions associated with this work. Vented gas cabinets and fumehoods are used with scrubbers to prevent release of air pollutants. RIT claims that all hazardous waste is disposed of according to university, local, state, and federals regulations. According to the universities, a Chemical Hygiene Plan (including nanomaterials), waste disposal, and safety protocols are in place monitored by the university Environmental Health and Safety office.

This proposal comprises laboratory operations and actions to promote the research and development of more efficient solar technologies; therefore this project is categorized as CX B3.6.

NEPA PROVISION

DOE has made a final NEPA determination for this award

Insert the following language in the award:

Note to Specialist :

none

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: _____ Date: 11/30/09
NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

☐ Field Office Manager review required

NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:

☐ Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
☐ Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature: _____ Date: _____
Field Office Manager