

Earth Abundant Thin-Film Solar Cells as a Sustainable Solar Energy Pathway

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Problem Statement

- Earth Abundant Thin-Film Solar Cells as a Sustainable Solar Energy Pathway
 - Why is this important? - Over 30 terawatts (10^{12} W) of new power will be needed globally by 2050
 - Why is it hard? Must be sustainable - environmental, social, behavioral, economic
 - Broader impacts of the problem: Realizing economically viable, environmentally benign, earth-abundant solar cells
 - Societal, behavioral, economic impact: Develop an understanding of environmental, societal, and economic issues

Research

- Key aspects of research objectives and intellectual merit:

Thrust 1: Scientific and technology innovation in earth-abundant, thin-film solar cells: Bulk homo junction and HHDJ concepts; FeS_2 , Cu_xS , Zn_3P_2 , CZTS

Thrust 2: Sustainability assessment of the new technology and products: life cycle sustainability assessments (LCSA) of viable environmental, economic, and sociopolitical (EES) measures

Research

- Results to date

Thrust 1: (1) Systems for materials synthesis and device fabrication have been set up

(2) Nanostructure materials and thin-films of FeS_2 , Cu_xS , Zn_3P_2 , CZTS have been synthesized.

Thrust 2: (1) Domestic analysis on key elements has been performed.

(2) LCA analysis of common solar cell technologies has been started.

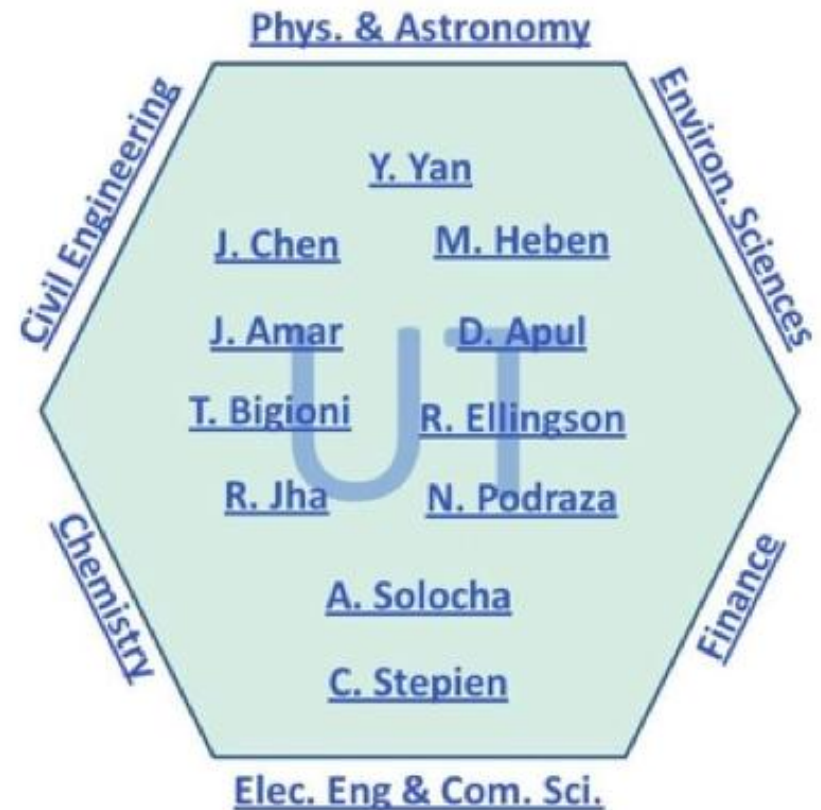
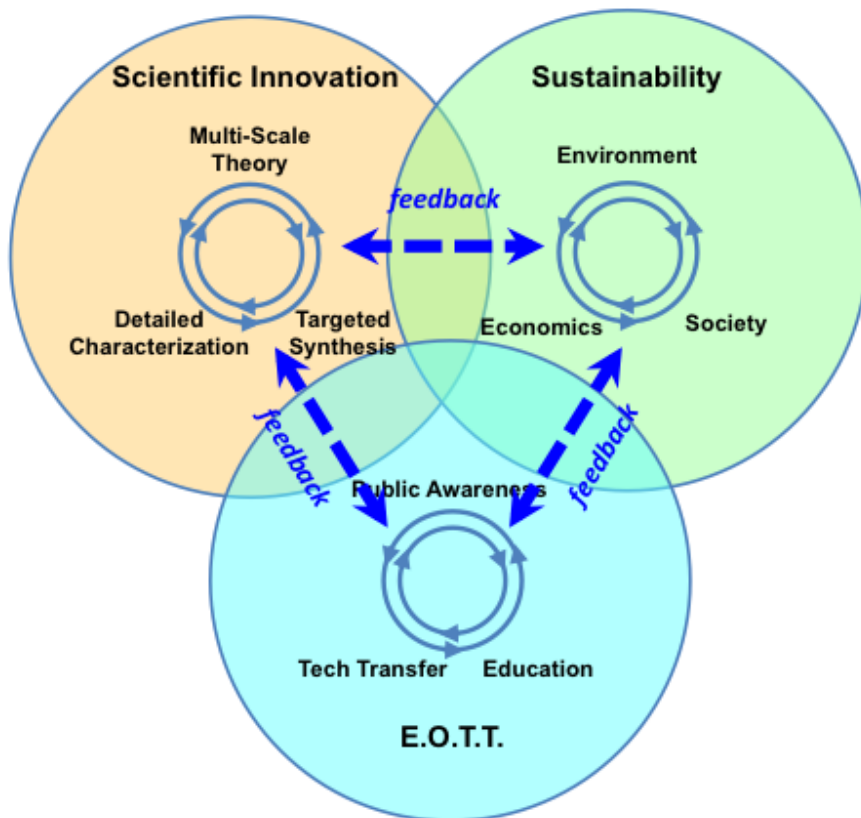
Research

- Any roadblocks encountered

Variables for environmental, societal, and economic issues are difficult to define

Multidisciplinary Aspect

- Explain the mode of multidisciplinary collaboration within the project team



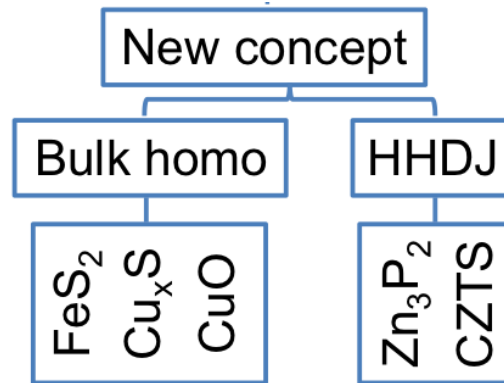
Multidisciplinary Aspect

- Explain how is the SBE (environmental, social, behavioral, economic) aspect of the work is enhancing the research

Thrust 2 will provide critical feedback for **Thrust 1** to improve the solar cell systems and processes from the sustainability point of view

Multidisciplinary Aspect

- Remaining tasks
 - Scientific



- Educational, training and outreach

Education: k-12 students and teachers, graduate and undergraduate students

Public awareness: Conferences, seminar, activities

Tech transfer and workforce training: Industrial partners