[별첨4_CP 양식]

KOREA INSTITUTE OF ENERGY RESEARCH

CONCEPT PAPER

for KIER International Cooperation project

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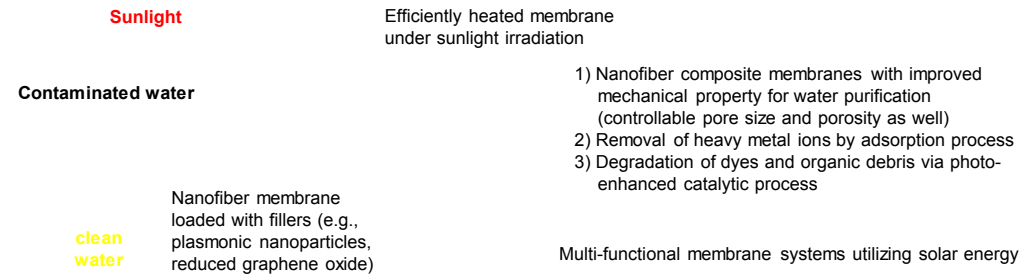
Title	**Solar-Induced Heating to Catalytic Membrane Systems for Water Purification**			
Description	✓ Joint-work with Prof. Jun-Hyun Kim at Illinois State Univ. (chemistry.illinoisstate.edu /jkim5/). ✓ Plasmonic metal nanoparticles have shown a unique ability to absorb light energy and convert it into heat (photothermal heating). ✓ This work will apply uniform nanoparticles to water purifying system. ✓ Integration of plasmonic nanoparticles into polymeric and inorganic substrates can allow more effective conversion of light energy into heat and increase mechanical stability.  ✓ Nanoparticles can uptake much broader absorption bands of the sunlight spectrum (i.e., efficient photothermal heating) via control of diverse structures of plasmonic particles. ✓ Insertion of these plasmonic particles into 2-D polymer nanofiber sheets with highly increased surface areas will not only convert solar energy to thermal heating continuously during the photothermally induced permeative and catalytic process under light irradiation, but also improve their stability. ✓ Converting these nanofiber composite mats into membrane type sheets with controlled pore size and porosity can effectively decompose toxic dyes and organic molecules in solution via photocatalytic process (developing novel water purification systems). ✓ The Kim's group at Illinois State University is responsible for designing plasmonic particles and nanofiber composite membranes to examine the water purification efficiency through photocatalytic process in small scales, while KIER will test the water purification of the composite membranes in larger scale. ✓ Their use can be extended to catalytic and electrochemical applications.			
Outcomes*	▶ Replacing electrical light sources (e.g., laser) with renewable sunlight for photothermal heating process ▶ Solar-induced heating of nanofiber membranes loaded with fillers (plasmonic particles or reduced graphene oxide) up to boiling water temperature of 95-100 °C ▶ Developing semi-permanent membranes for water purification systems via photocatalytic process under sunlight irradiation ▶ Minimum of two SCI and/or SCIE publications			