M.Sc. thesis project

Development of a biomimetic water separator

Effective separation of water from a gas mixture is important in diverse technical applications, such as water recirculation in fuel cell systems, life support systems in manned space flight, or freshwater production through desalination of seawater. Today, this is accomplished using a range of techniques, including membrane technology, centrifuges, and distillation.

The aim of this thesis project is to explore the potential of a novel method for water separation, which is inspired by how a Namib desert beetle recovers water from the desert air.

How?
A combination of surface structures and material properties allows the beetle to harvest liquid water from fog. The mechanism is not completely understood, but micro-sized grooves and bumps on the beetle's exoskeleton are involved in condensing and directing water toward the beetle's mouth. A combination of hydrophilic (water attracting) and hydrophobic (water repelling) areas on these structures are believed to increase the fog harvesting efficiency.

Project description
The thesis project consists of a combination of a literature study, experiments, and some form of modelling of the water separation process. The literature study is performed to establish what the current knowledge about the beetle and its water harvesting mechanism is. Experiments will then be carried out with textured surfaces consisting of combinations of hydrophilic and hydrophobic materials to systematically identify the factors that control the water harvesting efficiency. A simple model will then be used to optimize the water yield from the surface. The model could either be a regression model based on data from the experiments, a thermodynamic model, or a combination of both.

You
The suitable candidate is a curious and autonomous mechanical, physics or chemical engineering student with an interest in thermodynamics. As the project involves preparation of structured surfaces and building of a simple experimental set-up, we are looking for a person who enjoys practical work in the laboratory.

More information
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