

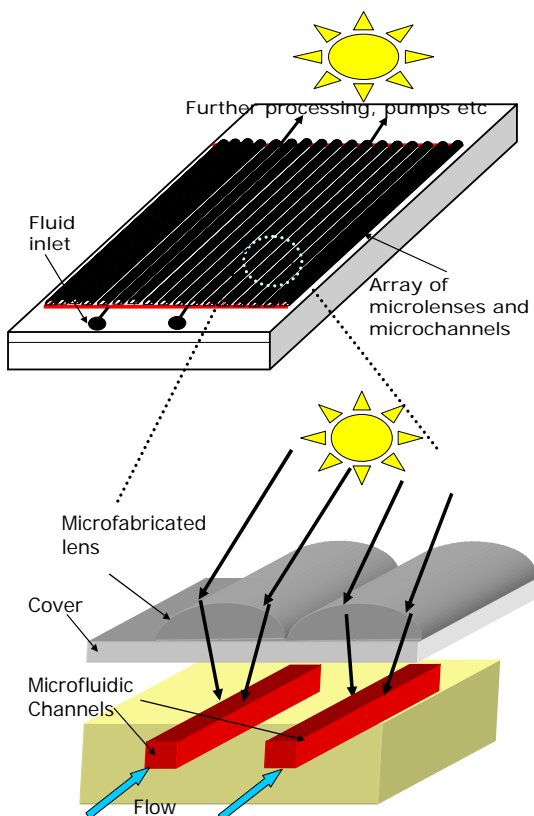
## A compact portable solar powered energy concentrator

### Background:

Modern society is becoming ever more reliant on portable devices that require power. At the same time the future of energy generation lies not in massive fossil-fuel consuming power stations, but on renewable and clean production methods that can also be made portable. In order to use solar energy to either produce high temperatures for increased chemical reaction kinetics for example, or high radiant energy flux for surface interactions, it is necessary to focus the incoming sunlight to increase the local radiation flux.

### What is the technology?

The invention uses micro and nano-fabrication techniques to produce an array of micro-lenses to focus light onto an array of micro-channels tens of micrometers wide. The micro-channels contain specific components, such as thin film selective surfaces, photovoltaic cells or titanium dioxide photo-catalysts. This basic elements of the invention can be seen in the figure below.



### Possible Application Areas

#### *Making portable hydrogen for micro fuel cells*

One of the most promising forms of portable clean, efficient electricity generation is the hydrogen fuel cell, which can store at least twice as much energy as current portable batteries. Hydrogen has the highest energy content per unit mass of any known fuel, but it has a low volumetric energy density which makes it challenging to transport and deliver. It is much more energy efficient and cheaper to produce hydrogen at the place it is required, such as adjacent to a micro PEM (proton exchange membrane) fuel cell. It has been calculated that the solar concentrator can achieve temperatures high enough to reform methanol into hydrogen using solar energy alone, and thus can be used to charge fuel cells to be used for example as power sources for lap-top computers or mobile phones.

#### *Photovoltaic cooling*

In photovoltaic cells heat is an unwanted byproduct of focusing light onto the cells to increase their power output using the same amount of silicon. This is because their efficiency decreases significantly with increased temperatures. The micro solar concentrator can focus the light on the bottom of the channels that contain the solar cells and use water to take the heat away and keep the temperature low. This waste heat could then be efficiently used to create extra power using, for example, an integrated thermoelectric generator.

#### *Water and air purification*

The micro-solar concentrator system proposed here would be an ideal environment for realisation of a TiO<sub>2</sub> photo-catalyst purification system. Sunlight activates the TiO<sub>2</sub> which then kills fluid borne microbes. Thus, the system could be used to produce a portable solar-powered water purification system for remote and developing areas, where there is a high need for such a system.

### Commercial Opportunity:

NewSouth Innovations is seeking industry partners who are interested in furthering the research and in commercialising this exciting new technology.

### Further Information:

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