以色列技术创新成果资料汇编

**节能环保行业**

特拉维夫大学

希伯来大学

威兹曼学院

**目 录**

[一、特拉维夫大学 1](#_Toc459727202)

[1. 6-2008-56 | 太阳能：通过半人工光学系统制氢 1](#_Toc459727203)

[2. 6-2010-49 | 纳米天线获取能量 1](#_Toc459727204)

[3. 6-2007-79 | 微型飞机主动流动驱动器 2](#_Toc459727205)

[4. 6-2012-372 | 用于石油挖掘的多孔介质表征 4](#_Toc459727206)

[5. 6-2012-372 | 土壤中石油杂质光谱检测 5](#_Toc459727207)

[6. 6-2009-48 | 电化学识别测量水中毒素 6](#_Toc459727208)

[7. 3-2013-420 | 绿色化学--以水为反应介质的新合成方法的发展 7](#_Toc459727209)

[二、希伯来大学 8](#_Toc459727210)

[1. 6-2006-63 | 运用于水族馆中减低硝酸盐含量的新型生物滤池 8](#_Toc459727211)

[2. 15-2007-1917 | 破坏生物膜的新型复合物 8](#_Toc459727212)

[3. 15-2010-2457 | 减低硝酸盐含量的新型生物滤池 9](#_Toc459727213)

[4. 9-2013-2979 | 旧轮胎再利用：转化为人工土壤，吸收材料 10](#_Toc459727214)

[5. 15-2013-2920 | 能抵抗强光，高温，高盐的高速生长藻类 11](#_Toc459727215)

[6. 15-2014-3075 | 基于钙钛矿结构的新型太阳能窗户 12](#_Toc459727216)

[三、威兹曼学院 14](#_Toc459727217)

[1. 无涡轮热发电(Thermal generation of electricity without a turbine) 14](#_Toc459727218)

[2. 新型热转换技术（A Novel technique of thermoelectric conversion） 16](#_Toc459727219)

[3. 分子光电元件 17](#_Toc459727220)

# 一、特拉维夫大学

## 6-2008-56 | 太阳能：通过半人工光学系统制氢

**6-2008-56 | Harvesting Solar Energy: Hydrogen production by a semi-artificial photo-system**

**The Technology技术**

An artificial ferredoxin-hydrogenase fusion enzyme (Fd-HydA) has been developed for the production of hydrogen gas in algae.  The Fd-HydA fusion enzyme interferes with the formation of the naturally occurring ferredoxin-sugar production pathway in photosystem I (PSI) complex and shuttles the donated electrons directly to the hydrogenase as shown in in vitro studies.  Preliminary expression of Fd-HydA in algae supports hydrogen production.

藻类中人工铁氢化酶已经被用于生产氢气，铁氢化酶与天然铁氧还蛋白糖在光系统I(psI)作用下发生反应产生氢气。藻类中铁氢化酶的初步表达是产生氢气。

**Stage of Development 发展现状**

Fd-HydA fusion enzyme has been constructed and expressed in E. coli and evidence of electron transfer has been demonstrated in vitro

Fd-HydA fusion protein increases rate of hydrogen photoproduction by 400% in vitro

Fd-HydA fusion protein has specific activities of 3000 U (U = 1 µmol hydrogen mg−1 min−1) for hydrogen evolution from reduced methyl viologen (MV).

Fd-HydA fusion enzyme is expressed and active in alga (preliminary work).

These results suggest a new direction for improvement of biohydrogen production and a means to further resolve the mechanisms that control partitioning of photosynthetic electron transport.

铁氢化酶已被构建并在大肠杆菌中表达，体外研究已经证实电子转移。

体外研究证实铁氢化酶蛋白光合产氢率达到了400%

减少甲基精，铁氢化酶蛋白的制氢活性为3000U((U = 1 µmol氢 mg−1 min−1)

铁氢化酶在藻类中表达，并有活动性。

这些结果为提高生物制氢的指明了新的发展方向，是进一步控制光合电子传递分配机制的有效手段。

## 6-2010-49 | 纳米天线获取能量

**6-2010-49 | Energy Harvesting using Nanoantennas**

**The Invention发明**

An array of nanowire antennas capable of absorbing electromagnetic radiation from the sun and connected to ultrafast rectifying diodes for useful generation of direct current for generating electrical power.

一种能够吸收太阳电磁辐射的纳米天线，可以连接到超速整流二极管上，从而发电。

**Potential Applications潜在应用**

Nanoantennas' ability to absorb infrared and visible radiation makes them promising devices for solar energy harvesting or as cooling devices to convert unwanted heat into electricity.  Since objects give off heat as infrared radiation, the nanoantennas could collect this radiation and convert it to useful electric energy. Such a system could cool down computers and other hot devices without the external power source required by air-conditioners and fans, while returning part of the energy producing the original heating effect. Furthermore, panels made of rectifying nanoantennas could use direct absorption of the sun's electromagnetic waves at these frequencies to power homes and other electrical devices.

纳米天线可吸收红外和可见光辐射，这种性能使他们可以用于太阳能产业中，可将多余的热能转化为电能。正是因为它可以吸热并转化为电能的特性，它可以用于电脑以及其他发热的设备上，不再象空调和风扇一样需要耗费电能，它可以给这些设备降温。另外，使用整流纳米天线制作的面板可以直接吸收太阳能，给家里以及其他电器供电。

**Advantages优势**

The use of rectifying nano-antennas can achieve much higher efficiencies than current or contemplated photovoltaic devices.  The antenna arrays can be tailored to specific wavelength giving them versatility to absorb and utilitze energy across the spectrum depending on what is available.  Metal nanowire arrays combined with rectifying diodes constructed from carbon nano tubes may be manufactured on very large thin films with a much lower cost than silicon based PV cells, making these suitable for panels that can be installed by unrolling them on roofs or walls.

采用这种技术能获得超预期的效能。纳米天线的排列方式可以根据需求设定，吸收光谱中特定需要的波长。金属纳米天线是由碳纳米整流二极管构成，可以生产成大面积薄片状，比硅晶光伏电池的成本更低，非常适合安装在屋顶或墙壁上。

**Patent专利**

Patents pending in US, Europe, India and China

在欧洲、美国、印度、中国正在申请专利

## 6-2007-79 | 微型飞机主动流动驱动器

**9-2007-79 | Miniature Air Vehicle Controlled and Propelled by Active Flow Control**

**The Invention发明**

Miniature Air Vehicles (MAV’s) with Active Flow Control (AFC) is an aviation invention in which the means for thrust generation, flight control and lift augmentation are created by the same fluidic actuators, located within the MAV.  This can solve many of the problems that inhibit further development of the field. The most compelling reason for using AFC for MAV’s, is that traditional control surfaces, as well as external motor-driven propellers, are eliminated and the only physically detectable evidence of the actuators is the streaming jet flow (with zero-mass flux) issuing from slots on the surface of the vehicle. Linkages, push-rods, propellers, hinges and moving surfaces are also eliminated.  This brings with it the potential for robustness and field-worthiness, hitherto considered unattainable within the context of MAV’s as well as radical improvements in the performance of low Reynolds numbers air vehicles.

带有主动流动驱动器（AFC）的微型飞机是一项航空发明，其推力产生、飞行控制和升举力都是由安装在微型飞机内的流体驱动器产生。解决了制约该领域进一步发展的许多问题。传统的驱动器采用外部电动螺旋桨的方式，而采用AFC驱动器后飞机外观不再有螺旋桨，唯一看到的是流体射流（零质量流量）从飞机表面的插槽喷出，不再需要传动的连杆、推杆、螺旋桨、铰链等。至今，在微型飞机领域以及提升低雷诺兹数飞机性能方面，该技术是非常先进的。

**The Need需求**

The Miniature Air Vehicle (MAV) with Active Flow Control (AFC) is essentially a flying wing, which is made up of two half-wings that are swept-back at an angle, a configuration based on the YB-35 and B-2 flying-wing bombers.

The span and mean-chord of the wing of one example are approximately 450mm and 100mm, respectively and the vehicle’s weight is 2.25N. The invention integrates the three major flight systems (lift, guidance and thrust) into one. The wing has no traditional external control surfaces or propulsion means, and externally is extremely robust and simple. Instead, the wing incorporates a number of spanwise oriented slots, which contain arrays of fluidic actuators, each of which provides approximately 0.01N of thrust for each 1 Watt of power.

These actuators supply enough thrust to fly the wing at 10-15 m/s. Several rows of such internally-mounted actuators also provide guidance, by proper distribution of the actuation authority along the chord and across the span of the vehicle.

带有该驱动器的微型飞机的机翼由两个带有一定角度的半翅组成，结构语句YB-35 和B-2飞行轰炸机。本发明将三种主要的飞行系统（提升力，制导力和推力）整合到一起，机翼没哟传动的推进装置，外部简单，功能强大。机翼上采用了一些导向槽，包含流体驱动器阵列，每个1瓦电约产生0.01N的推力。驱动器每秒可产生10-15米的推力。通过适当的排布驱动器可以产生制导力。

Real-time control is provided in a manner that ensures smooth and rapid handling qualities. Control laws allow a human operator to remotely fly the MAV by utilizing a flight control computer in conjunction with fuzzy logic algorithms. The proposed MAV exhibits structural robustness, large storage capabilities and low drag. A similar concept could be used to enhance the effectiveness of axisymmetric bodies and with robust actuators, currently under development, operate up to Mach numbers of 0.5.

实时控制可以确保飞机平稳、高速飞行。操作人员可以通过电脑远程控制微型飞机，该微型飞机结构稳定，阻力小，储存力强。另外一个用于提高飞机对称性，带有强大的驱动器的类似的产品，目前正在研发中，操作起来马赫数为0.5.

**Potential Applications潜在应用**

There has been increasing interest in the development of very small flight vehicles. This is a result of new military and environmental needs, as well as the maturation of the technological feasibility.

It is now widely believed that MAVs will be capable of providing the individual soldier with on-demand information about his surroundings, resulting in unprecedented situational awareness, greater effectiveness and fewer casualties. Moreover, technological spin-offs will soon find their way to other applications such as detection of toxic or radioactive waste or assistance in law enforcement.

微型飞机在军事以及环境方面的具有广阔的发展前景，相关的技术也日益成熟。微型飞机可以向士兵报告周边环境信息，使其了解周围未知区域，减少伤亡。另外，技术的发展还可以实现一些其他应用，比如探测到毒品，放射性元素，实现援助等。

**Patent专利**

Granted US 在美国授予了专利

## 6-2012-372 | 用于石油挖掘的多孔介质表征

**6-2012-372 | Characterization of Porous Media for Petroleum Excavations**

**The Technology技术**

A diffusion magnetic resonance (MR) method for non-invasively visualizing geochemistry and microstructures of porous sedimentary rock samples.  The method provides quantification of pore sizes, pore size distribution and measure on pore eccentricities even for heterogeneous samples with inter connections and three-dimensional organization and in the presence of free water or other liquids. No a priori knowledge on the sizes or distribution is required.
Our novel technology utilizes an angular bipolar double-pulsed-field gradient (bp-d-PFG) operated with variance in multiple parameters. A novel analysis reconstructs the pore size distribution (termed concentric Double PFG, CDPFG). This implementation method is unique, and our experimental results (see supporting publications) are the first that demonstrate such capability.

采用扩散磁共振法对非入侵性可视地球化学以及多孔沉积岩样品的微观结构进行研究。该方法可以检测孔径尺寸、孔径尺寸分布、以及孔偏心测量，甚至异构样品内部结构和三维构成、游离水或其他液体的存在。不需要先验大小和分布。这项新技术采用角形双脉冲梯度磁场(bp-d-PFG)，采用多参数方差操作。采用新的分析重建孔径分布（称为同心双梯度、cdpfg）。这种方法均有创新性，我们的实验结果（发表在相关出版物上）首次演示了这种性能。

**The Need 需求**

Noninvasive determination of pore size and shape in different rocks and sediments is of importance in different geological application and in particular for the petroleum and logging industries.  These parameters are indices that enable estimation of the amount of capillary-bound water – which in turn allows for determination of efficient oil and gas excavation/production potential.

对各种岩石和沉积物孔隙大小形状的测定在不同的地质应用十分重要，特别是石油和勘井业。通过这些参数可以预估出开采能力和可行性。

Most diffusion MR methods use single pulsed-field-gradient (PFG) MR sequences; however such sequences are only beneficial for measurement of uniform, highly ordered media.

Conventional microscopy techniques (such as optics and X-ray) exhibit tremendous spatial resolution to image porous media; however, they are limited to laboratories and small samples. Also, optical imaging techniques are sensitive only to the surfaces of samples.

大多数磁共振法采用单脉冲梯度磁场（PFG)，这种单脉冲法只能测到分布均匀有序的介质。常规显微镜技术（如光学显微镜和X光）可以成像多孔介质。但是这些常规手段仅限实验室以及小的样品中使用。也就是说光学成像技术只适合样品研究。

 With the development of inside-out NMR systems such as well-logging and the NMR-Mouse, the present MR method is suitable for both field and laboratory exploration and analysis.

随着核磁共振测井等技术的发展，目前的磁共振不仅适用于现场，也适用于实验室的研究。

**Advantages优势**

Determining pore size, shape and organization by non-invasive, non-destructive MR.

Volumetric data is gathered, rather than superficial information imaged by microscopy.

Ability of obtaining structural information on samples having poly-disperse, randomly oriented pores (characterized by magnetic in-homogeneities), with large background gradients.

Field analysis potential.

确定孔隙大小，形状和组织（非侵入性，非破坏性）。

大量采集数据，而不是局限于显微镜成像的表面信息。

对多分散性，孔径随机性强的样品可检测结构，获取信息。

现场分析能力

**Patents专利**

Two patent application families: PCT/IL2011/000506 (Cohen) and PCT/IL2012/050307 (Nevo

两项专利申请

## 6-2012-372 | 土壤中石油杂质光谱检测

**6-2012-372 | Hyperspectral detection of petroleum impurities in soil**

**Technology技术**

A spectrometer is used in the field to measure reflected radiation from soil samples over a wide frequency range.  The resulting spectrum intensity data is analyzed and compared to a stored database and the presence of hydrocarbons in the soil is detected.

该技术通过光谱仪来检测样品反射光波，通过对所得的数据进行分析比较，从而分析土壤中石油烃类物质的存在。

**Background and Advantages背景和优势**

Reflectance spectrometry uses the reflective part of the electromagnetic radiation across the VIS-NIR-SWIR spectral region (350-2500nm) that illuminates the target in question and collects the reflected radiation from its surroundings. The ratio between the incident and reflected radiations across the entire spectral bands (a spectrum) holds significant chemical and physical information about the sensed  target. For diagnosing areas suspected as contaminated and the possibility to control the rehabilitation process, there is a great need for an objective environmentally friendly method to rapidly detect low concentrations of petroleum hydrocarbon in soils. Current methods are based on chemical analysis and require acquiring samples, transportation to a laboratory and labor intensive analysis with expensive equipment.  Our technology allows rapid in-situ measurments with standard spectrometers.

采用光谱反射法可以获取重要的化学信息、物理信息。在疑似被污染的区域，通过这种方法可以检测出土壤中很低的石油烃类物质的含量。目前的方法先采集样品，再送到实验室采用昂贵的设备进行化学分析。而我们的技术实现了现场的快速检测。

**Patents 专利**

US provisional patent submitted

美国临时专利已提交申请

**Project Status 项目状态**

Lab samples have been successfully tested

实验室样品已经成功测试

## 6-2009-48 | 电化学识别测量水中毒素

**6-2009-48 | Electrochemically Identifying and Measuring Genotoxins in Water**

**The Invention发明**

A field deployable device for near real-time identification and quantitiatve measurement of genotoxins in water.  The device contains a low cost disposable probe head which quickly and accurately alerts if genotoxins are present at dangerous levels. The probe consists of genetically modified bacteria which are sensitive to various genotoxins and produce an electrical response proportional to the concentration of genotoxin in the water sample.

为可展开的装置，在现场可以接近实时对水中毒素进行识别和定量检测。该装置配置了低成本的一次性探头，如果毒素超过警戒线，可以迅速精确的提醒报警。探头带有转基因菌种，这些菌种对毒素十分敏感，能根据水中毒素的浓度产生不同程度的响应。

**Potential Applications潜在应用**

Among the contaminants which can enter the water supply, some of the most dangerous are genotoxins which have the ability to damage human and animal DNA and cause mutations.  Sources of genotoxins include industrial effluents and possibly pharmaceuticals.  Therefore the ability to monitor and alert to the presence of genotoxins is important.  Wastewater treatment plants have water quality monitoring devices, but not all drinking water supplies are tested for genotoxins.

水的污染物中，最危险的是可以破坏人和动物的DNA，引起基因突变的毒素。毒素的来源包括工业废水和药品污染。因此，检测水是否含有毒素非常重要。污水处理厂有水质监控设备，但是不是所有的饮用水都进行了毒素检测。

**Advantages优势**

Current methods for detecting genotoxins in water require sampling and complicated off-site assays.  Our device is portable meaning the test can be performed quickly on-site.  Additionally, the probe can be used as an in-line test continuously monitoring the water quality.  Because the modified bacteria are toxin specific, both toxin identification and concentration can be monitored.  The probe itself is a low cost disposable card that is easily replacable.

目前检测水中是否含有毒素的方法是先进行采样，再进行复杂的非现场检测。而我们的设备是便携的，可以在现场进行检测，另外探头还可以用于在线监控水质。由于探头上的转基因细菌对毒素来说具有特异性，既可以用来检测毒素的存在又可以用来监测毒素的浓度。探头成本很低，为一次性实用，可以经常更换。

**Patent**

US patent pending

美国专利申请中

## 3-2013-420 | 绿色化学--以水为反应介质的新合成方法的发展

**3-2013-420 | Green Chemistry - Development of new synthetic methodologies that use water as the reaction medium**

**The Technology技术**

Development of new synthetic methodologies that use water as the reaction medium.

Two directions are presently pursued: the use of amphiphilic block-copolymer ligands for micellar catalysis in water and synthetic organic transformations under the “on water” conditions. Both directions specifically address the recycling of the reaction media, which is essential for the development of “green” synthetic alternatives.

Once such development is our capability of "Salt Control Selectivity in Aqueous Reactions" - dramatic selectivity of the reaction products to a specific target – tipping from a 0% yield to a 100% yield.

以水为反应介质的新合成方法的发展：目前的研究有两个方向：使用两性分子聚合基进行水中细胞催化， 和以水为条件的合成有机转换。这两种研究方向的共同介质水，是绿色新合成方法的基本要素。一旦研究成为现实， 收益0%的产品可以转化为收益100%。

**The Need需求**

All biologically relevant organic reactions take place in the aqueous media. On the other hand, very few synthetic organic transformations are performed with water as a solvent. Considering that organic solvents often represent the major pollution component of multi-step organic synthesis, their replacement by the environmentally benign water can significantly reduce the amount of chemical waste in synthetic processes.

水介质中生物会发生相关的反应，极少数会发生合成有机转换。考虑到有机溶剂往往包括多种污染成份，如果替代成水可以极大减少环境污染。

# 二、希伯来大学

## 6-2006-63 | 运用于水族馆中减低硝酸盐含量的新型生物滤池

**亮点**

降低淡水和海水水族馆中的硝酸盐含量

改善水质,以适应广泛的水族馆鱼类和延长他们的寿命

长期来看，降低由硝酸盐到氮气的转变，从而减少诱发细菌生长的碳源

水族馆水净化系统中的应用。

**创新点**

新颖的渗透性聚合物粒子含有促进发酵和反硝化的细菌，从而减少作为细菌生长碳源的氮气;技术优于现有的水族馆硝酸盐去除系统。

**关键特征**

细菌不损害鱼类

淡水和海洋水族馆皆有效

反硝化活性持续至少几个月的时间

去除硝酸盐粒子可以根据需求定制。

**发展历程碑**

寻求技术许可和研究经费来完成研究，并且全面适应技术标准化的工业过程。

**应用领域**

消费者越来越浓厚的兴趣爱好，导致不断引进的新的观赏鱼类，但高的硝酸盐含量水域不适合鱼类生长，因此对水质有高要求标准。目前,只有数量有限的商业生物过滤系统可以去除水族馆中的硝酸盐。

## 15-2007-1917 | 破坏生物膜的新型复合物

**项目简介：**

牙科学院医学、口腔医学- Steinberg Doron

学院制药、药物化学和天然产物- (Late) Srebnik Morris

Polacheck Itzhack

新型复合物抑制真菌和细菌生物膜的形成

**类别：**

清洁技术、环境、水技术,生物淤积、生物膜、食品包装

**发展阶段：**

我们的技术已经被证明可以减少高达60%的生物膜后涂层应用在管道的内表面,在以色列主要是用在回收水中心(SAFDAN)

**专利状况：**

专利申请在美国(2011 - 0281921 - a1)和欧洲(2365969)

**市场规模：**

反污染解决方案的市场总估计每年数十亿美元

**亮点**

新型复合物破坏细胞通讯（群体感应）干扰生物膜的形成

第一个化合物表现出交叉王国生物膜的抑制和逆转

这种环保的方法来控制生物膜的形成人工表面,如在工业和农业中水管或空调管道

非溶性聚合物涂料

**我们的创新**

新型复合物，合成类似天然汽车inducer-2结构，用于水管、膜聚合物涂料、食品包装和其他表面破坏群体感应的细菌细胞和阻止生物膜的形成。

**主要特点**

无抗菌或抗真菌作用，可避免抗药性菌株的发展

环保安全的无浸涂涂料

真菌和细菌生物膜的有效性

抑制生物膜形成

**发展历程**

合成的化合物

农业，市政和工业用水管道，家庭和医院的其他领域的试验

**机遇**

减少传热或液压工业冷却系统,将水喷射飞机,和堵塞水过滤器，能够解决生物膜相关成本问题的美国工业每年数十亿美元的腐蚀管道

应用范围包括工业水处理，过滤膜，油漆和涂料，灌溉管道，造纸机，食品包装，防止生物膜的形成

降低能源消耗降低海水淡化和水回收流程成本

**专利**

8865909

## 15-2010-2457 | 减低硝酸盐含量的新型生物滤池

**项目简介：**

农学食品和环境质量科学、生物化学、食品科学和营养学-Nussinovitch Amos

农学食品和环境质量科学、动物科学-Van Rijn Jaap

Tal Joseph

水处理新方法

**类别：**

清洁能源、环境、水技术、生物过滤

**发展阶段：**

在高达200公升，硝酸盐的积累是成功的控制了水族馆展示技术

**专利状况：**

美国专利授予（6297033），欧洲专利授予（0836644），以色列专利授予（117783）

**亮点**

技术降低淡水和海水中的硝酸盐含量。

提高水族馆鱼的水环境质量，延长寿命。

提高硝酸盐污染地表和地下水水质的研究。

碳源的存在下，在较长时间内减少硝酸盐氮的细菌。

能够在水族馆和硝酸盐污染水体的净化水系统中的应用。

**我们的创新**

反硝化菌在去除水中硝酸盐的新型聚合物载体固定化小球水过滤器。渗透性聚合物珠含有硝化细菌或混合发酵和反硝化细菌加碳源减少硝酸盐氮的气体；技术优于现有的硝酸盐去除系统。

**主要特点**

非病原菌净化菌

在淡水和海水中都有效

反硝化活性持续一段延长的至少几个月

可以适应定制的要求

**发展**

寻找机会许可的技术和资金规模初步建立

**机遇**

越来越多的国际关注和更严格的环境要求的地表水和地下水的硝酸盐污染的需要，提高了技术的地下水和饮用水处理

**专利**

6297033

## 9-2013-2979 | 旧轮胎再利用：转化为人工土壤，吸收材料

**项目简介：**

一种将橡胶转换成具有吸附6~8倍油或水重量的小颗粒和新工艺。

因此颗粒被用于具有特殊水保护功能的人工土壤。

第二个应用是净化被石油污染的水。颗粒能快速选择性吸附油。

可以将这些吸油后的颗粒挤压后，回收再用。

我们根据利用废旧轮胎进行原位土壤修复和高效石油泄漏处理的过程，提出了一种新的经济有效的技术，实现油的回收。

因此这项技术被用于具有特殊水保护功能的人工土壤。这些应用是基于将再生废旧橡胶作为原材料进行颗粒生产。



**石油泄漏处理**

经过处理后的橡胶颗粒，在1小时内吸附听的能力可以达到5公斤油/公斤橡胶颗粒。恢复过程快速简单，只需几分钟，90%以上的油就可被回收。



**污染土壤的修复**

经过处理后的橡胶颗粒，在1小时内吸附听的能力可以达到8公斤油/公斤橡胶颗粒。

## 15-2013-2920 | 能抵抗强光，高温，高盐的高速生长藻类

**项目简介**

生物质和生物能源的新藻类

**所属目录**

农业、植物遗传，清洁能源与环境，能源，动物饲料

发展阶段：

准备商业生产

**专利状态**

美国专利申请备案

**市场规模**

认证，授权和管理安全软件超过25亿美元

**亮点**

室外生长很快和非常高的密度。

即使在光照强度两倍充满阳光下也没有光抑制损害。

在2.5％的氯化钠下成长非常快。

在45℃下成长都不会受到影响。

**我们的创新**

光合生物，包括藻类和植物，很容易受到光抑制，过剩的光合反应作用能引起氧化损伤，严重降低了产量。在室外生长的藻类由于需要到细胞高密度生长，以减少采收成本，生产设施遭受在表面的光太多和太少几毫米之下。此外在许多情况下，可能需要冷却的媒介利用微咸水中细胞生长的优势。

我们分离并鉴定小绿藻具有独特的能力，包括：

最快的生长速度，并在藻类达到了109个细胞/ mL的细胞密度曾报道生物量的积累; OD730的20纳米。

优化和压力条件，包括高温和盐度下宽动态范围的增长。

快速光合速率低和高辐照度和完整的阻力下光抑制。

独特的耐脱水性。

高光诱导的结构和代谢改变，血脂含量3倍升高。

此外其他生物技术的使用，蛋白质非常丰富，这种藻类可以作为鱼、动物和人的原理。

（图：一个分裂的藻细胞）

**主要特征**

可以为动物和人类提供优秀的蛋白质和碳水化合物

在一个宽范围的条件下，在咸水水域中可以快速增长到高密度

发展里程碑：

准备在商业藻类生长设施中使用

**机遇**

由于其独特的特点，该藻在藻类生物量增长设施领域的可以改变规则。

## 15-2014-3075 | 基于钙钛矿结构的新型太阳能窗户

**亮点**

有机和无机材料被广泛用于办公楼和窗户的半透明太阳能电池，充分利用外表面获取低成本的太阳能。

钙钛矿型太阳能电池组装简单，低成本、高转换效率，使其成为低成本的太阳能能源的令人兴奋的新候选人。

目前如果不使用昂贵的有机聚合空穴传输材料，还没有简单的方法生产孔钙钛矿太阳能电池

低成本的方法需要的是能够精确控制电池和高转换效率，以最大限度地提高整体的太阳能电池的效率。

 **我们的创新**

一种用于制备半透明、空穴导体钙钛矿型太阳能电池的简单生产方法。

（一）PCE的半透明的空穴传输材料的平均透明度在400–800 nm波长范围之内

（二）钙钛矿型太阳能电池的平均透明性与初始装配溶液的浓度

（三）图片从左到右，19%，28%，38%，64%和67%不同的平均透明度的半透明的空穴输送材料电池

（四）具有不同的平均透明度的半透明的空穴输送材料电池的电流-电压曲线。电池的转化效率0.41%，1.02%和2.39%分别对应的是39%，25%和12%的透明度。

**主要特点**

避免了半透明孔导体因为空穴传输材料吸收可见光部分导致的透明度下降。

所有电磁表面镀层在环境环境中可以方便的使用，低成本组装或旋涂沉积方法（根据不同的退火•处理）。

半透明电池具有20% - 70%的透明度。

**发展里程碑**

下一阶段将进一步提高这些半透明电池的效率。一旦效率提高，将开发一个原型。

**机遇**

使用钙钛矿吸收材料的设备的太阳能电池效率从2009年的3.8%增加到2014的20.1%，使其成为进展最为迅速的太阳能技术。他们的高效率和廉价的生产成本使钙钛矿太阳能电池具有非常好的商业化吸引力，预计2017年在市场上会出现多个这样有前途的初创公司。

# 三、威兹曼学院

## 无涡轮热发电(Thermal generation of electricity without a turbine)



**简介**

一种新的可再生能源法，用于储存聚光太阳能发电（CSP）的热能，转化为可分配的电化学能量。

目前CSP技术的一个关键问题，是根据实际需求进行电力的分派和输送。CSP在进一步大规模商业部署，取决于太阳能电力的年度贡献增加，能更好的应对这一资源的间歇性，并快速整合现有的配电基础设施，即智能电网。这里介绍的技术为这些问题提供了一个独特的解决方法，同时也可以显著降低与CSP系统相关的资金成本和环境成本。

与传统的热CSP电站不同，这种新方法不需要使用一个涡轮机就能将热能转化为电能，在放电周期中直接从电化学电池中获得电能。此外，这种储能方法排除了电力发电机的使用（如涡轮机、风力发电机、光伏板），这些电力发电机通过提供电力给电池电极端子来对补给化学电池。这种方法减少了费用，解决了传统的太阳能发电厂的低效率问题。

**应用**

作为商业或私人使用的模块化独立电气设备

分担现有发电厂的负荷

**优势**

直接将太阳能热能转换为电能。

在干旱地区，不需要运输大量的水。

电池可以瞬间改变负载：

1. 智能电网的使用和用电调度
2. 易与其他绿色能源配合

**技术要点**

该系统利用了基于Na-S电池技术的可充电热化学循环。其创新点在于，用集中太阳辐射进行热化学充电，代替了目前我们所采用的光伏和风力。有了这个概念，最终太阳能到电能的效率可以时间大约50%，对现有的CSP技术是巨大的经济影响。钠硫电池的放电过程通常发生在温度范围300和350℃之间，其中钠、硫和多硫化钠的反应产物，Na2Sx（其中x = 3到5），以液体状态存在。电池的充电是在1500-1700℃的温度下实现的，当多硫化钠完全分解时，电池就恢复了全电动势。该项技术是通过CSP热效应将多硫化钠复合物分解为Na和S成分来对Na-S电池进行充电，而不是利用一个外部电源。

[**Thermal generation of electricity without a turbine**](http://www.yedarnd.com/technologies/thermal-generation-electricity-without-turbine-0)



**Summary**

A novel renewable energy method for storage of concentrated solar power (CSP) thermal energy directly to electrochemical energy that can be used for for distribution.

A crucial issue for CSP technologies today is providing energy capable of dispatchable generation, that is, sources of electricity whose power load can be changed instantaneously with power demand. Further commercial deployment of CSP on a large scale depends on increase of the annual contribution of solar electricity, better coping with the intermittent nature of this resource and rapid integration with existing electrical distribution infrastructure, i.e. smart grids.
The technology presented here offers a unique solution to these problems while significantly reducing monetary and environmental costs associated with current CSP systems.

Unlike conventional thermal CSP plants, the novel method does not require the use of a turbine to convert heat to electricity, and the electricity is directly obtained from the electrochemical cell during its discharge cycle. Moreover, this energy storage technique precludes the use of electric power generators (e.g. turbines, wind turbines, photovoltaic panels) which are often used to recharge electrochemical cells by applying electrical power to the cells' electrode terminals. This reduces expenses and eliminates inefficiencies of a traditional solar electrical plant.

**Applications**

As modular stand-alone electrical plant for commercial or private use.

Integrate into existing power plants for load sharing.

**Advantages**

Directly transform solar thermal energy into electrical potential energy.

Transport of large amounts of water in arid areas is not required.

Battery can change loading instantaneously for:

1. Use in smart grid and dispatchable generation
2. Easily Incorporated with other green energy solutions

**Technology's Essence**

This novel system utilizes a rechargeable thermochemical cycle based on Na-S battery technology. The innovation is the exploitation of concentrated solar radiation for thermo-chemical charging instead of electricity from photovoltaic or wind resources as done today. With this concept, a final efficiency of about 50% from solar to electricity can be achieved, which makes a monumental economic impact on existing CSP technologies. The sodium-sulfur battery discharge cycle usually works at temperatures ranging between 300 and 350oC, at which the sodium, sulfur and the reaction product of sodium polysulfide, Na2Sx (where x=3 to 5), exist in their liquid state. Charging of the battery is achieved at temperatures of 1500-1700 oC, when sodium polysulfide is fully decomposed and the full electrical potential of the battery is restored.[1] Instead of charging the Na-S Battery with an external source of electricity to decompose the sodium polysulfide compound back to its Na and S ingredients, it is proposed that the decomposition process will be achieved thermally via CSP.

## 新型热转换技术（A Novel technique of thermoelectric conversion）

**简介**

所谓热电效应，是指温度与电压互相转换的现象。热电效应广泛应用与热能保存。虽然目前热电转换效率是很低（5-8%），但是魏茨曼研究所开发了新技术，此项技术具有改变这一现状的突破性的潜力。

Yoseph-Imry教授主和他在魏茨曼研究所的团队，基于一种新的能增强性能的TE设备，研究出了热电转换技术。核心发明是双结热电器装置，该装置中的一个热电门插入两个电区之间，起到提高热电转换效率的作用。

**应用**

受益于转换技术的发展，很多TE设备都将获得更好的TE效率。到2023年，热电能量采集器市场将达到8.65亿美元。目前的TE市场是由能量收集应用和一些细分市场所主导，包括：

汽车能源收集应用，目前内燃机产生的大约40%能量，是通过排气以热量的形式损失掉的。

到2023年，无线电设备/传感器市场预计占热电采集和冷却的整体市场的三分之一。

**优势**

为了降低热电模块的成本，促进其获得广泛应用，TE需要解决几个问题：

低转化效率

热电材料中所使用的化学元素的毒性和低可用性。

因此，主要的市场挑战是达到更高的效率，以及使用低成本的热电材料。这项新研究的技术可以解决以上两个问题。

**技术原理**

Yoseph-Imry教授主和他在魏茨曼研究所的团队，研究出了一种新型双结TE装置，该装置中的一个热电门插入两个电区之间，起到提高热电转换效率的作用。热电效率取决于价值曲线图（ZT）。价值曲线图表明，要研发3-T TE装饰，则需要实现高ZT值。

该发明的本质特征，是通过输入两个独立可调电压和温度参数，以优化装置的热效率。

[**A Novel technique of thermoelectric conversion**](http://www.yedarnd.com/technologies/novel-technique-thermoelectric-conversion-0)

**Summary**

The thermoelectric effect is the direct conversion of temperature differences to electric voltage and vice versa. Thermoelectric effects are used in various applications, where heat energy is saved, that would be otherwise lost. Although the TE conversion efficiency is nowadays low (5-8%), the novel technique developed at Weizmann Institute, has a disruptive potential to change this market.

Prof. Y. Imry and his team at Weizmann Institute came up with Thermal Electric conversion technique, based on a new TE device architecture which allows performance enhancement. The core invention is in the field of Bi-junction thermoelectric device architecture, having a thermoelectric gate interposed between two electric regions, leading to thermal electric conversion efficiency optimization.

**Applications**

Various TE devices will benefit from better TE efficiency, achieved by the developed conversion technique. The growing market for thermoelectric energy harvesters will reach $865 million by 2023. Current TE market is driven by consumer energy harvesting applications and some niche segments:

Automotive energy harvesting applications, since around 40% of the energy produced by internal combustion engines is currently lost in heat through the exhaust.

Wireless devices/sensors segment is forecasted to account for over a third of the overall market for thermoelectric harvesters and cooling by 2023.

**Advantages**

In order to drive down the thermoelectric module costs and facilitate broad deployment, TE has several barriers to overcome: low conversion efficiency; toxicity and low availability of chemical elements constituting part of the thermoelectric materials.

In this context, the main TE market challenges are reaching higher efficiencies using low cost thermoelectric materials. These challenges can be addressed by the proposed technology.

**Technology's Essence**

Prof. Y. Imry and his team at Weizmann Institute have developed novel bi-junction TE device, having a thermoelectric gate interposed between two electric regions, aiming at TE efficiency improvement. Thermoelectric efficiency depends on the figure of merit (ZT). The figure-of-merit curves, for the developed 3-T TE device configurations show that higher ZT should be achieved.

The secret essence of the invented configuration is in using two independently adjustable input parameters - voltage and temperature - as drivers for optimizing device thermoelectric efficiency.

## 分子光电元件

**摘要**

一种新型光电分子薄膜：有机、低电压薄膜，独创性的带有控制薄膜光响应的特性。不同的金属氧化状态，薄膜稳定性强，因此适用于非易失性存储设备。

**应用**

专利中涉及的技术和“有机”低电压设备的设计以及高效合成相关，适用于光通信、电子开关应用、传感器和非易失性（闪存）存储设备。闪存是硬盘和数码相机的基本部件。其他一些应用还包括: 电子墨水，存储元件（可重写存储器、只读存储器和一写多读存储器），显示器，气体传感器，在有机溶剂中的水PPM( 浓度)水平检测，NO+浓度检测，光谱滤波器、（空间）光调制器。

**优势**

可逆光学响应

两种状态下稳定

低电压操作

**技术**

本发明涉及一种光电分子薄膜的设计、合成，并利用其光学特性实现的电化学转换。这种薄膜设计简单（附于透明的导电电极），具有独创的控制薄膜光响应的特性。随着金属氧化状态的改变会发生可逆光学响应，薄膜在氧化状态中仍然保持稳定。仅1.5V的低电压就可以进行操作，触发电荷储存和光响应，稳定性高，这一点非常适用于闪存存储器。该系统还适用于各种化合物，包括水和NO+的光学和电子检测。

**Molecular Electro-Optical Devices**

**Summary**

Novel molecular thin films for optoelectronics: organic, low-voltage films, allow for unprecedented control of the films optical response properties. The films are stable in different metal oxidation states and are therefore ideal for use with non-volatile memory devices.

**Applications**

The specific scientific and technology issues addressed in the patent are relevant both to the design and synthesis of efficient "all-organic" low-voltage devices, of great interest for optical telecommunications, electronic switching applications, sensors, and non-volatile (FLASH) memory devices. Flash memory is the essential component in solid-state hard disks and digital cameras. Other applications, include: Electronic Ink, memory elements (rewritable memory, read-only-memory and write-once-read-many memory), Displays, Gas sensors, Detection of ppm levels of water in organic solvents, Detection of NO+ in sub-ppm levels, Spectral filters, (Spatial) light modulators.

**Advantages**

Fully reversible optical response

Stable in both states

Low voltage operation

**Technology's Essence**

The invention deals with design, synthesis, and electrochemical switching of optical properties of molecular thin films for opto-electronics. The straightforward design of our films (attached to transparent conducting electrodes) offers unprecedented electrochemical control of thin film optical response properties. Fully reversible optical responses occur with variation of the metal oxidation state. The films are stable in both oxidation states. The low-voltage operation of 1.5 V necessary to trigger the charge storage and the optical responses in combination with the high stability may make this system an ideal candidate for the formation non-volatile memory devices. The same system can be used for optical and electronic detection of various compounds, including water and NO+.