Y-Prize

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Empowering Ideas

Pamela Beatrice
Director, Engineering, Physical and Applied Science
beatricp@penn.edu

Ryne DuBose
Asst Director, Engineering Physical and Applied Science
rdubose@upenn.edu

www.pci.upenn.edu

Thing to consider

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- Objective of Y-Prize is to identify and develop new applications and/or markets for existing technologies.
- Intellectual property protection is one factor to consider when developing technology with commercial applications
- There may be existing intellectual property owned by Penn that would be required for commercializing a product or service based upon the Penn technology

Intellectual Property

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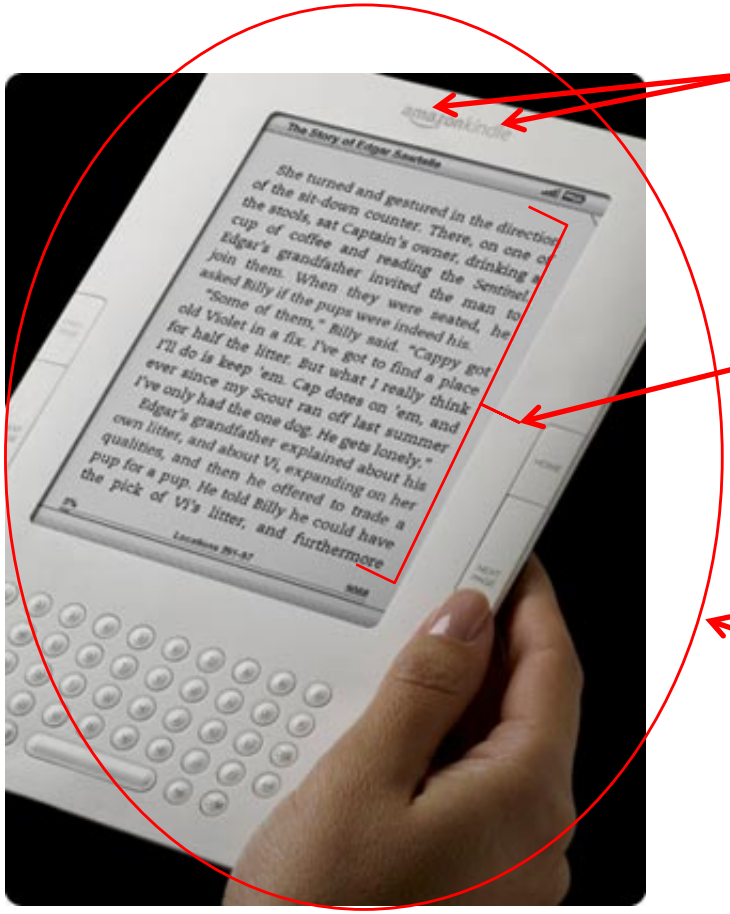

Trademark protects words, names, or symbols used in commerce

Copyright protects original works of authorship

Patent protects process, machine, article of manufacture, or composition of matter

What is a Patent?

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…is a property right created by law to protect intangible assets.

To be patentable, an invention must be statutory, new, useful, non-obvious, enabled, described, work of inventors.

Statutory Patentable Subject Matter

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- Process
- Machine
- Article of manufacture
- Composition of matter
- Improvement of any of the above

Note: In addition to utility patents, encompassing one of the categories above, patent protection is available for (1) ornamental design of an article of manufacture or (2) asexually reproduced plant varieties by design and plant patents.

What is NOT Patentable

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- Laws of nature
- Physical phenomena
- Abstract ideas
- Literary, dramatic, musical, and artistic works (these can be Copyright protected).
- Inventions which are:
  - Not useful (such as perpetual motion machines); or
  - Offensive to public morality

Novel, Non-Obvious, Useful

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Novel– Not known, published, used publicly, or offered for sale more than one year prior to the filing date.

Most other countries do not have the one year limited grace period for publication as allowed by the AIA.

Non-Obvious – Not obvious to "one of skill in the art".

Useful – Has a useful purpose and operates.

Enabled, Described, Work of Inventors

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Enablement – Must teach others how to make and use the invention.

Written Description – Must describe invention in enough detail that a person of ordinary skill in the art could make it.

Work of the Inventors

What does a patent do?

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A patent allows the owner of the patent to prevent others from making, using, selling, importing products and methods covered by the issued claims for a period of 20 years from the filing date of the patent.

Why obtain a patent?

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Intangible assets are increasingly valuable.

Early 1980's: ~ 60% of corporate value comprised tangible assets, 40% IP and other intangible assets.

Today: ~ 15% of corporate value comprises tangible assets, 85% IP and other intangible assets.

http://www.oceantomo.com/system/files/SPIntangibles_Chart2010.pdf

Y-Prize Technologies

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Ultrathin robust plate nanomaterials

(*Dr. Igor Bargatin, Keivan Davami*)

Existing Penn IP: PCT Application

PCT/US15/50008 filed 9/14/2015

https://www.google.com/patents/WO2016044173A1

Ultrathin robust plate nanomaterials

PROBLEM

Mechanical properties of most conventional materials deteriorate with a decrease in density. Thin, planar aluminum or fiberglass materials used at the nanoscale become brittle, are prone to curling, or prone to cracking. Creating materials that can exhibit superior mechanical properties and withstand such deformations to provide lightweight flexural stiffness and structural strength is crucial for the creation of microrobotic vehicles, microelectronics, aircraft, thermal insulators, and other similar applications.

SOLUTION

The present invention describes a novel Aluminum-Oxide nano-honeycomb structured material that is highly robust, strong, and flexible. Deformations of thin, planar films are mitigated by patterning films in three dimensions to include out-of-plane strengthening ribs in the form of honeycomb networks, which are known to offer a high isotropic bending stiffness per unit mass. The strength and stiffness of the honeycomb structure allows a large area thin film to be fabricated without warping or fracturing. The flexibility of the structure is also novel, as most comparable materials are brittle and would break if subjected to the type of deformation described in this work.

TECHNOLOGY OVERVIEW

The nano-honeycomb shells described here have been fabricated from AlO2 ceramic materials via atomic layer deposition. The same fabrication principle could be used to form structures from Al, Si, Ti, or Pt. The thicknesses fabricated to date vary between 20 and 70 nm, and the largest single sheet measured 0.5 cm x 1 cm in area. Other comparable materials are very brittle at this thickness and cannot achieve the degree of flexible shape recovery that these nano-honeycombs exhibit.

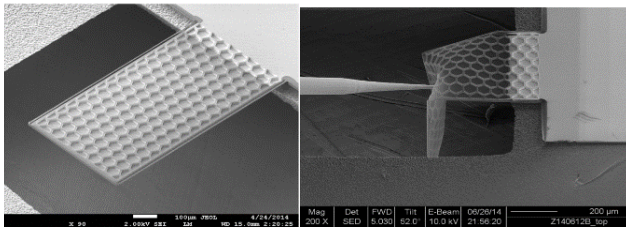

Figure 1: Cantilevered honeycomb plate subjected to 90˚ bending without fracture

ADVANTAGES:

•Ultrathin material (20-70nm thickness) with nano-honeycomb structural enhancement

•Robust mechanical characteristics (e.g., broken area recovery and damage localization, shape recovery, ductility, flexural rigidity, low mass, flexibility, conformal deposition, and near-transparency)

MEET THE INVENTOR

Igor Bargatin, PhD
Assistant Professor
Mechanical Engineering and Applied Mechanics

Prof. Bargatin's research interests are focused on micro- and nanoelectromechanical systems (MEMS/NEMS) for new applications in energy conversion, optics, and smart materials. The lab designs and tests new types of devices, such as microfabricated thermionic energy converters, which convert heat directly to electricity at very high temperatures by literally boiling electrons off a surface and using them as a “working fluid” in a heat engine.

http://bargatin.seas.upenn.edu/

FURTHER INFORMATION

IP STATUS
Provisional application filed 9/15/2014

BUSINESS OPPORTUNITIES
License, Sponsored Research

PCI CONTACT
Ryne DuBose
Technology Licensing Officer
E: rdubose@upenn.edu
P: 215-746-8107

REFERENCES
http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6765673&tag=1

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Robust Smart Windows

Reversible Switching from Transparent to Color

(*Dr. Shu Yang*)

Existing Penn IP: PCT Application
PCT/US16/17127 filed 2/16/2016

Publication Number WO 2016/140779

https://patents.google.com/patent/WO2016140779A1/en

ROBUST SMART WINDOWS:

Reversible Switching from Transparent to Color

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PROBLEM

Commercial buildings in the United States alone account for nearly 40% of the total energy consumption. Among them, electricity is the largest energy source for buildings. Therefore, the design of new energy efficient materials and technologies is crucial to meet goals such as the Net-Zero Energy Commercial Building Initiative (CBI) put forward by the U.S. Department of Energy (DOE). Approaches to block or reflect intense sunlight when needed, and to capture the sun's light and heat when desirable, remain

SOLUTION

A low cost, durable composite film used as a window "shade" where the transparency can be tailored to adjust heat and light. The film could also be mounted between two panes of glass and motor controlled.

ADVANTAGES:

- The initial state is transparent vs. technologies such as polymer dispersed liquid crystals and electrochromic displays.
- The switch between transparency and colored states has been reversibly cycled at least 1000 times without losing the film's structural and optical integrity.
- The "window" can be mass-produced using low-cost methods from abundant materials.
- In addition to light blocking smart windows, it can also be used for display or security applications.

TECHNOLOGY OVERVIEW

TECHNOLOGY OVERVIEW:

A composite film consisting of a thin layer of quasi-amorphous array of silica nanoparticles (NPs) is embedded in a bulk elastomeric polymer film.

- It is highly transparent (>90% transmittance in the visible wavelength) in the initial state.
- Upon mechanical stretching, the transmittance is dramatically reduced to 30% and displays angle-independent structural color at a strain >30%.
- The displayed reflective color is a so-called structural color, which could be tuned by the silica NP size; the color displayed is invariant with the applied strain.
- The switch between transparency and colored states has been reversibly cycled over 1000 times without losing the film's structural and optical integrity.

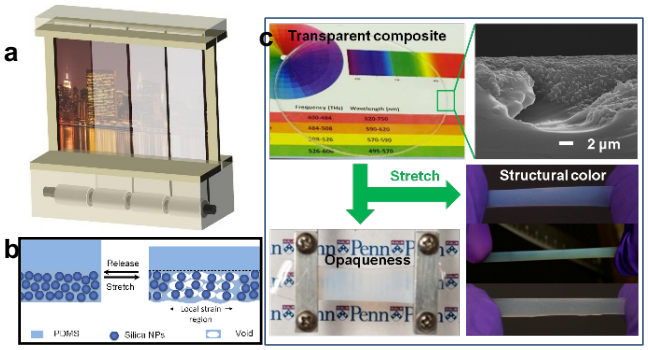

Figure 1. (a) Illustration of a smart window. (b) Schematic illustrating void formation around silica particles when stretched. (c) Optical images showing reversible opacity and transparency upon stretching and release.

MEET THE INVENTOR

Shu Yang, PhD
Professor of Materials Science and Engineering

Dr. Yang's work focuses on design, synthesis, fabrication and characterization of complex soft and hybrid materials.

Research Webpage:
http://www.seas.upenn.edu/~shuyang/

FURTHER INFORMATION

IP STATUS
PCT patent application

BUSINESS OPPORTUNITIES
Sponsored Research, License

PCI CONTACT
Pamela Beatrice
Technology Licensing Officer
beatricp@upenn.edu
215-573-4513

Reference:
Advanced Materials
Volume 27 Issue 15, pages 2489-2495, 2 MAR 2015 DOI: 10.1002/adma.201500281

Ref. 15-7442

NEW INTELLECTUAL PROPERTY

May be created as teams continue to develop product concept.

If the Y-Prize team and Penn advisors develop new intellectual property (IP) during the Y-Prize, PCI will be glad to meet and determine the ownership of such new IP in accordance with Penn's Patent Policy.

Existing Penn IP may be needed to make and sell product concept.

PCI will be glad to meet with teams to discuss an option or license to available Penn IP.

What does a license do?

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A license agreement is the mechanism by which the owner of the patent grants another party (company) the rights to practice the claimed invention.

General Patent Information

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- http://www.uspto.gov/inventors/
- http://www.uspto.gov/patents/resources/general_info_concerning_patents.jsp
- http://www.uspto.gov/patents/process/index.jsp
- www.google.com/patents