



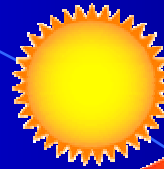
Fueling the H2 Highway

Hydrogen and Fuel Cell Summit, W.P.I.



John M. Guerra, P.E.
President and CEO
Nanoptek Corporation
Maynard, Massachusetts
www.nanoptek.com

Photolysis



$$E = h\nu$$

- **Hydrogen from water and sunlight**

- Clean, renewable
- Photocatalyst reduces threshold energy by 0.7 - 0.9 eV

- **Titania (TiO₂) photocatalyst**

- Dissociates water into hydrogen and oxygen
- Inert, low cost
- Honda et al, Kafalas et al, 1970's

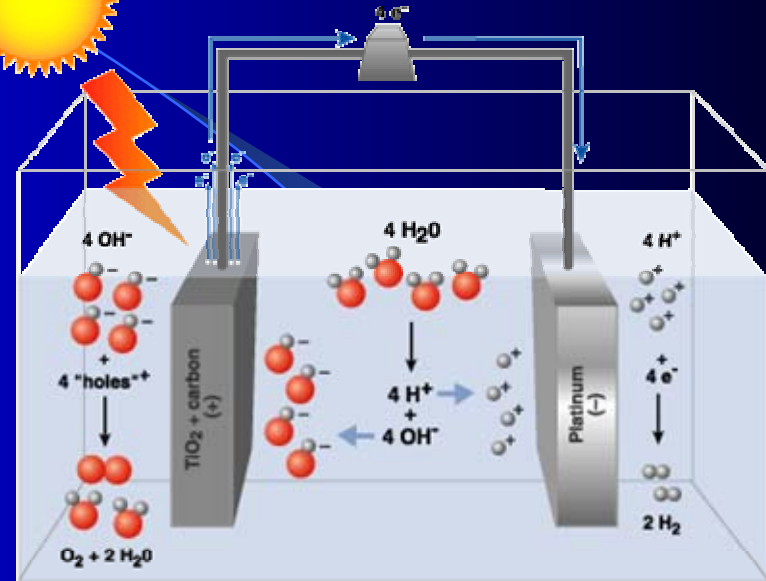
- **Requires ultra-violet light**

- Less than 5% of solar spectrum
- 3.0 eV bandgap

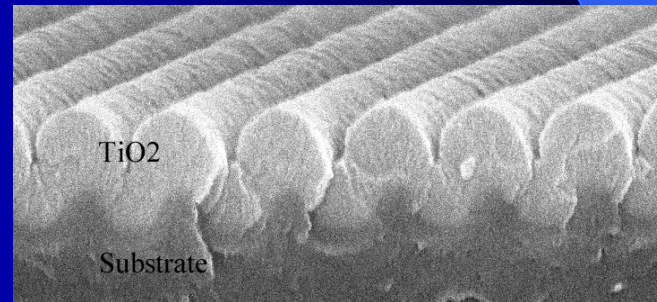
- **Nanoptek's unique titania V Energy photocatalyst uses sunlight more efficiently**

- Nanostructured template induces GPa stress
- Inter-atomic spacing is increased, lowering potential
- Bandgap is lowered, absorbs more of visible solar
- Higher light harvesting efficiency
- Point-of-use production reduces transport difficulty
- Patent pending

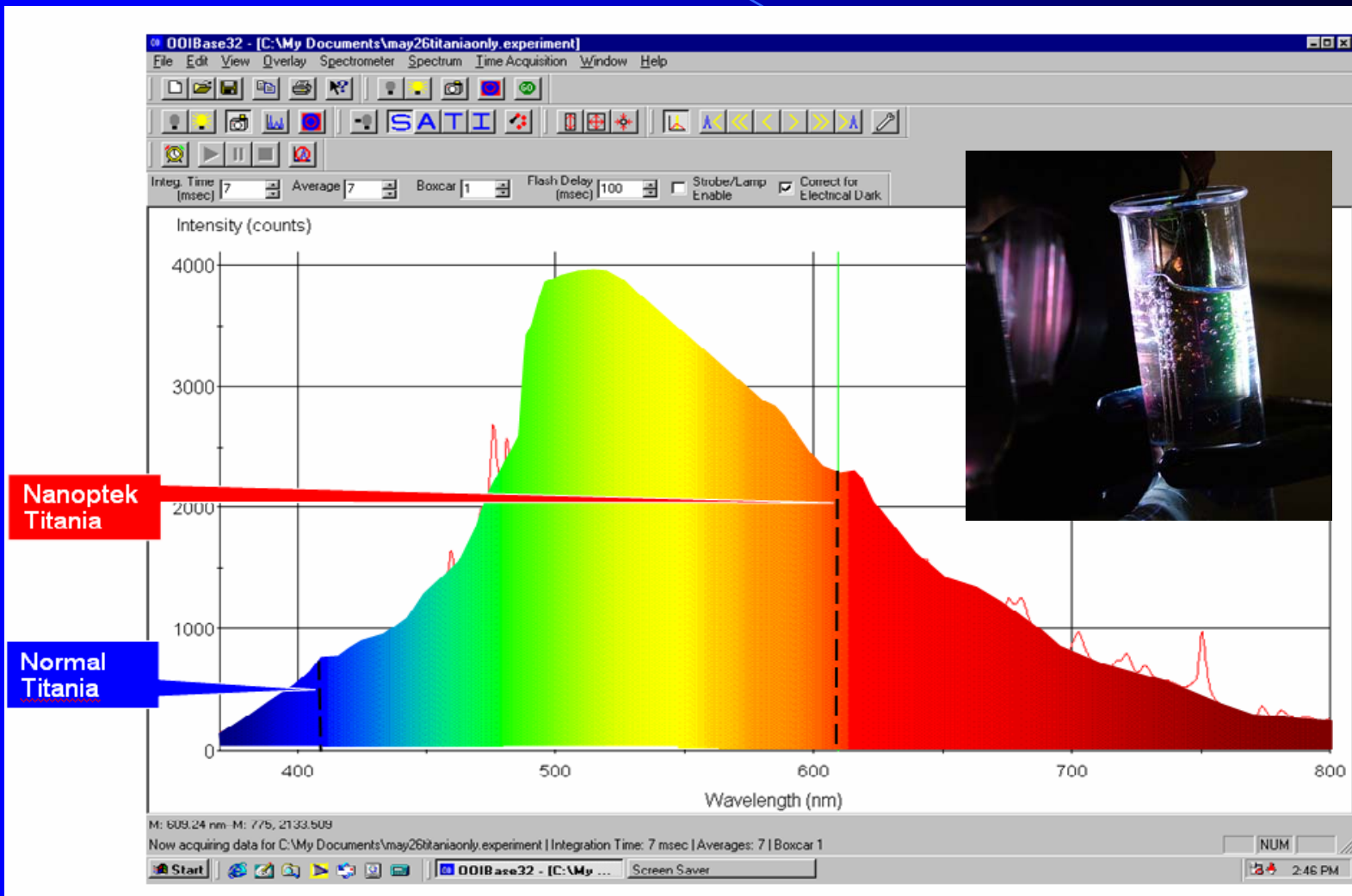
- **NASA awarded Nanoptek a Phase II SBIR**



(Figure adapted from *Science*, 2001)
 $4\text{H}_2\text{O} + 4\text{e}^- \rightarrow 2\text{H}_2 + 4\text{OH}^-$

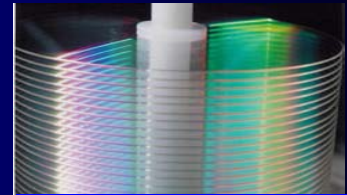


Light Harvest Efficiency

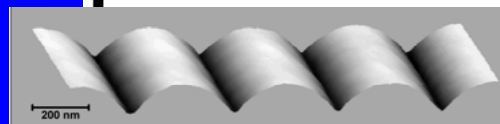
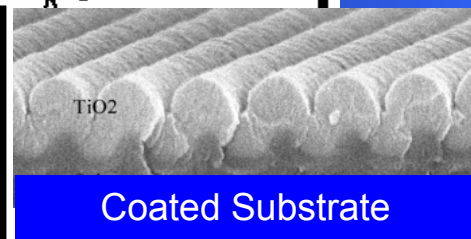
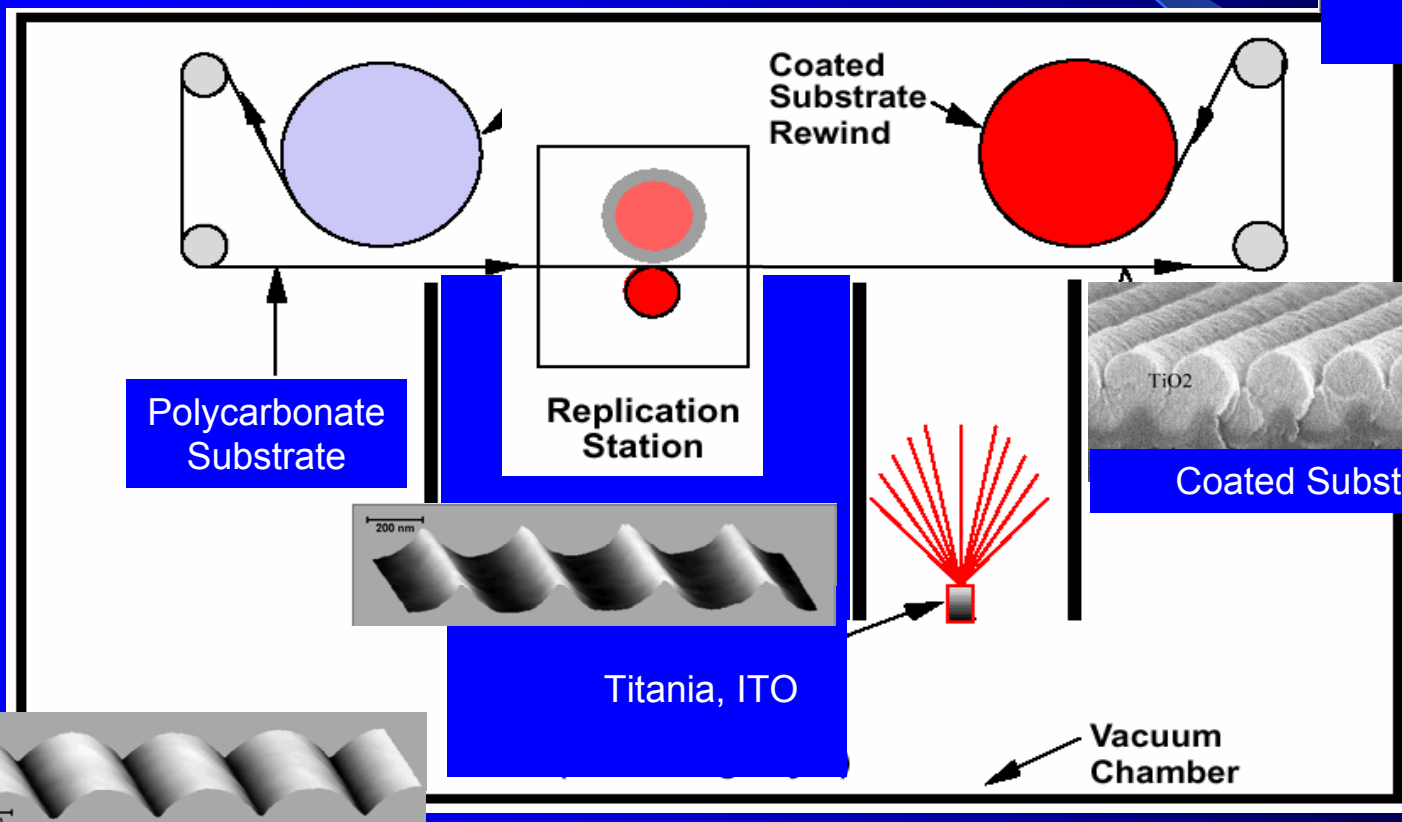


Manufacturing

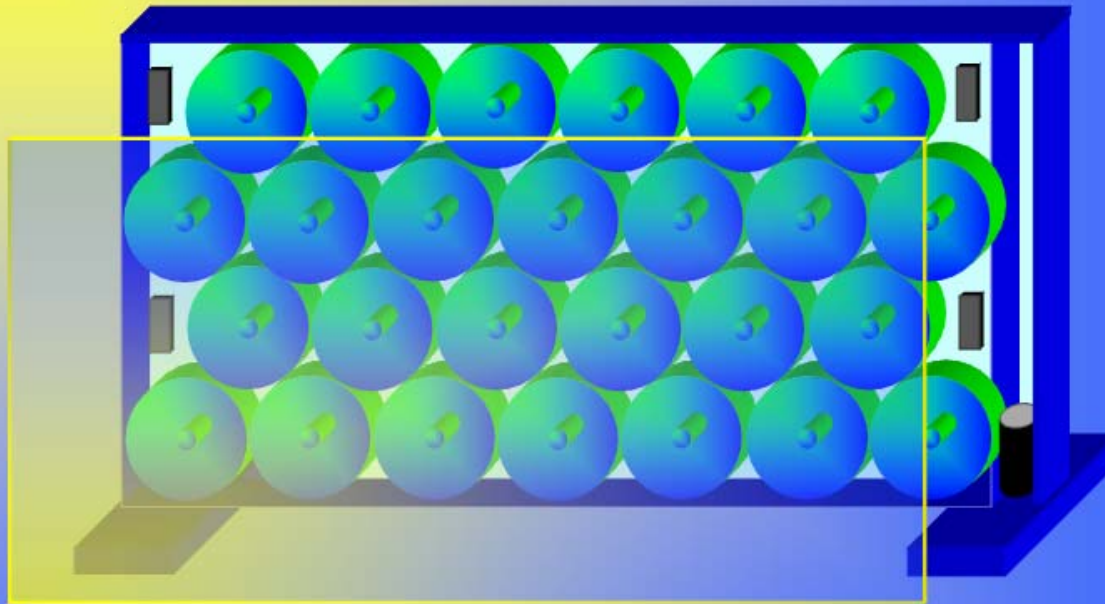
Injection/compression mold,
or roll-to-roll emboss,
low cost mass production



Assembly



The Product



NANOPEK Mod 1 Solar Hydrogen Generator						
Effective Area	Number of Elements	Photo-current	Bias Voltage	Hydrogen Output	Light Harvest Efficiency	Photon Conversion Efficiency
0.25 m ²	78	3.2A	1.2 VDC	3 L/hr 720 L/month	37%	9.6%