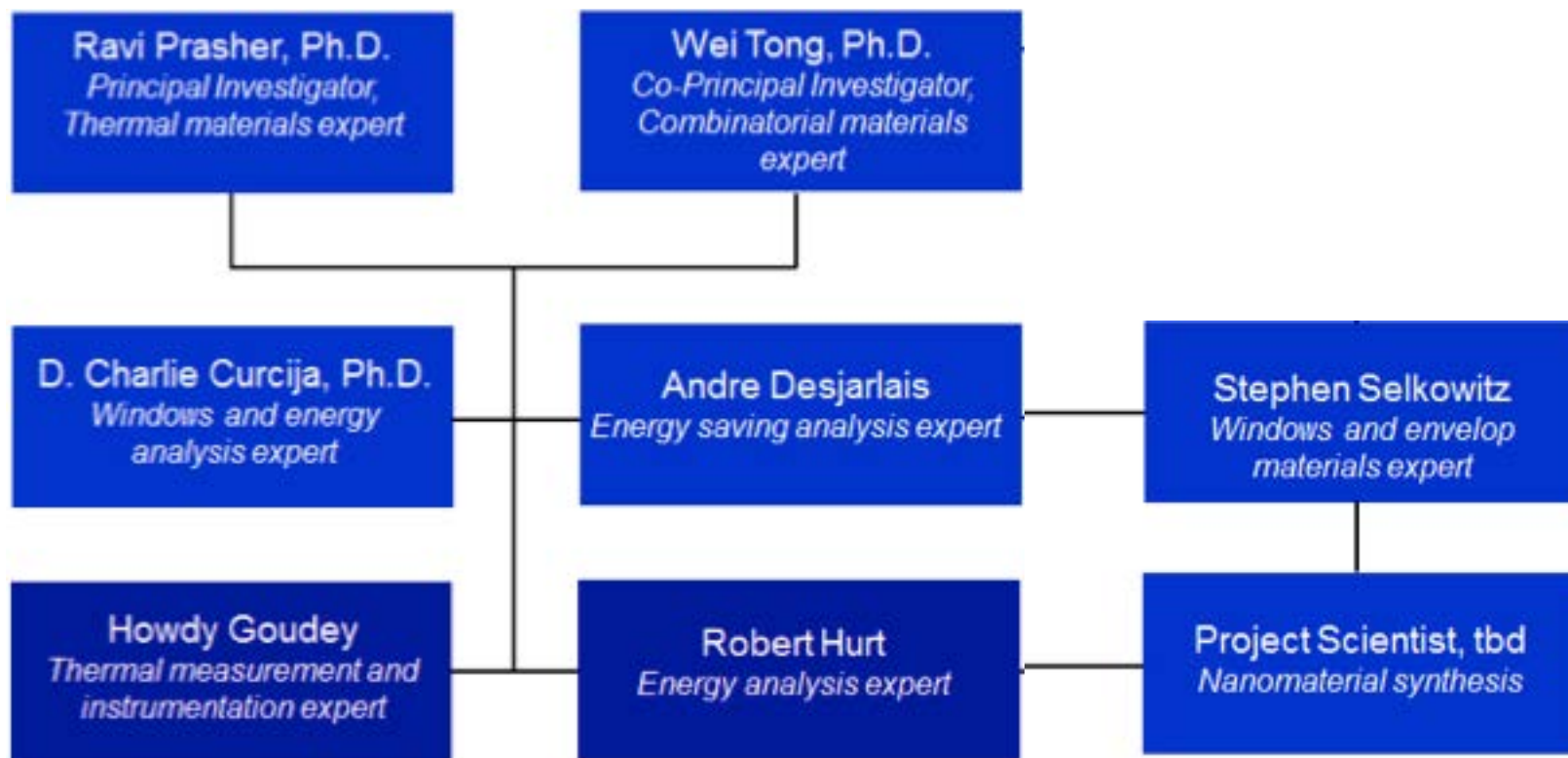


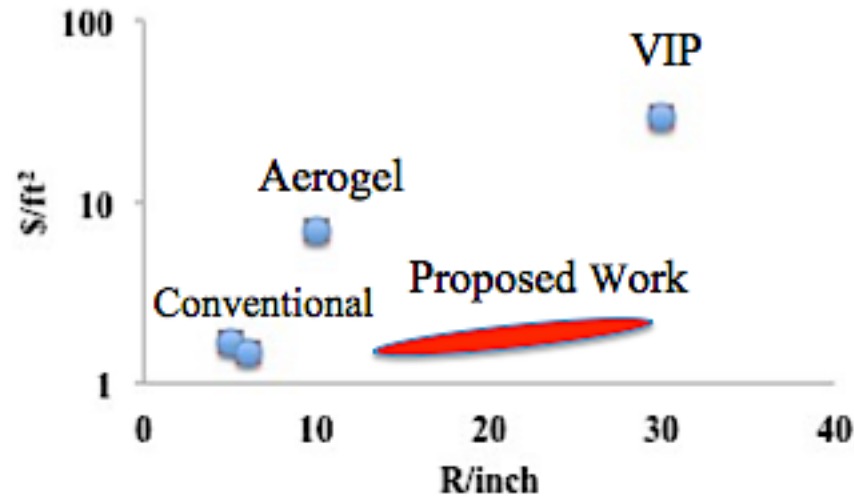
Robust Super Insulation at a Competitive Price

Ravi Prasher

Project Team



Project Objectives



- R/inch value at least 2 – 4 times higher than conventional
- An order-of-magnitude lower cost compared to emerging technologies
- Significantly higher mechanical robustness compared to aerogel and considerably higher flexibility compared to VIP.

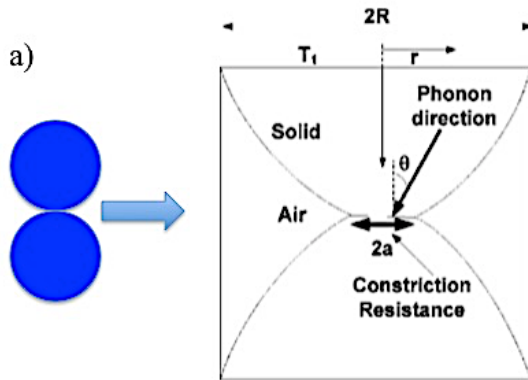
*\$/ft² for conventional insulations are from (www.homedepot.com); for aerogel from (www.aerogel.com); and for VIP from (www.rparts.com)

Technology Solution

- Manipulate heat transfer at interfaces in nano materials

$$l_{eff} = 3 \frac{a^2}{R} \int \tau \sin(\theta) \cos(\theta) d\theta$$

$$a^2/R = (1.125\pi\gamma/E)^{2/3}R^{1/3}$$

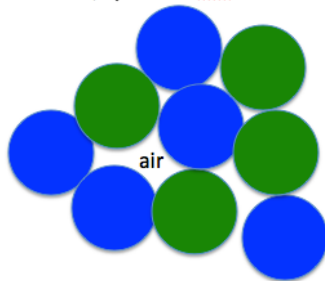
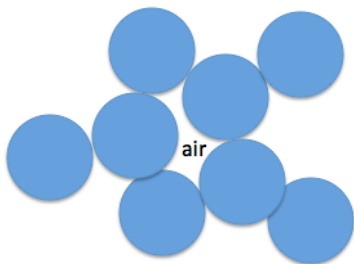


$$\tau = \frac{4z_1z_2 \cos \theta_1 \cos \theta_2}{(z_1 \cos \theta_1 + z_2 \cos \theta_2)^2 + \frac{\omega^2}{K_A^2} (z_1z_2 \cos \theta_1 \cos \theta_2)^2}$$

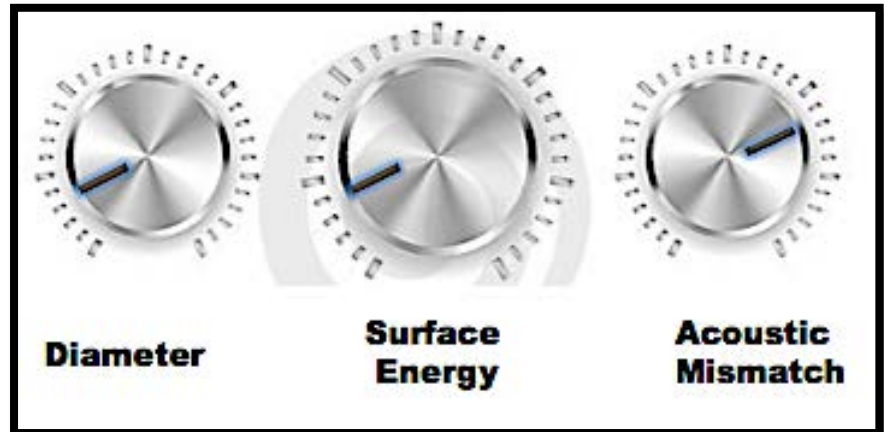
$$K \propto \gamma/\sigma^6$$

b) Scenario 1: Controlling Surface Energy
Alumina, $\gamma = 30 \text{ mJ/m}^2$

Scenario 2: Controlling Acoustic Mismatch, Alumina and Silica, $\gamma = 100 \text{ mJ/m}^2$



The KEY knobs



Impact

- We anticipate that the new insulation technology being developed in this project would be a potential replacement for insulations used in walls of residential and commercial buildings.
- It will be a viable retrofit insulation that provides extremely high thermal insulation cost-effectively and fits within the space limitations of existing buildings.
- Technical Potential 1672 TBtu (1.6 quads) and unstaged adoption potential 534 TBtu (0.5 quads).



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