

Questions Answered and Additional Resources

Brown-bag question: What kinds of materials are piezoelectric? Here are examples of piezoelectric materials:

- Quartz
- PZT (lead zirconium titanate)
- Rochelle salt
- Topaz

More examples: <http://en.wikipedia.org/wiki/Piezoelectricity#Materials>

Brown-bag question: Does the degree of wetting depend on the circumference of a tube? (In other words, does the degree to which the liquid moves up in the walls, shown in Step 1 of Slide #6, depend on the radius?) I looked into this and I think the answer is no, it does not depend on the radius.

The details of wetting are pretty complicated, but if you're interested in learning more this Wikipedia article seems pretty good: <http://en.wikipedia.org/wiki/Wetting>

The presentation includes many links, for both the images and relevant articles. Here's a list of the most useful links:

- **Capillary action**
 - Overview: http://chemwiki.ucdavis.edu/Under_Construction/chem1/States_of_Matter/Liquids_and_their_Interfaces
 - Lab-on-a-Chip: http://www.zurich.ibm.com/news/09/lab_on_a_chip.html
 - New adhesive devices: <http://www.livescience.com/6038-spider-man-device-humans-walk-walls.html>
- **Piezoelectrics**
 - Overview: <http://en.wikipedia.org/wiki/Piezoelectricity>
 - Gyroscopes for cameras: <http://www.nec-tokin.com/english/product/piezodevice2/ceramicgyro.html>
 - Concussion sensors: <http://news.byu.edu/releases/archive13/Nov/helmetsmartfoam/1310-76%20117.jpg>
 - Harvesting energy from roads (cool animation!) <http://innowattech.co.il/index.aspx>
 - Other energy harvesting examples
 - <http://www.gizmag.com/in-shoe-energy-harvester/19623/>
 - <http://inhabitat.com/green-a-go-go-at-londons-first-eco-disco/>
 - http://www.microgensystems.co/content/MicroGen_BOLT-INDUSTRIAL_Jun2013.pdf
 - <http://www.treehugger.com/clean-technology/piezo-shower-heats-water-without-electricity.html>
 - <http://www.gizmag.com/insect-cyborgs/20596/>

In the presentation, we suggested some complementary NanoDays activities. Here they are with their links:

- **Gravity (related to Capillary Action)**

Exploring Forces: Static Electricity (NanoDays 2011 and 2012)

http://nisenet.org/catalog/programs/exploring_forces - static_electricity_nanodays_2011_2012

Exploring Forces: Gravity (NanoDays 08, 09, 10)

http://nisenet.org/catalog/programs/exploring_forces - gravity_nanodays_08_09_10

- **Smart Materials (related to Piezoelectric Effect)**

Exploring Materials: Oobleck (NanoDays 2014)

http://nisenet.org/catalog/programs/exploring_materials - oobleck

Exploring Materials: Liquid Crystals (NanoDays 08, 09, 10)

http://nisenet.org/catalog/programs/exploring_materials - liquid_crystals_nanodays_08_09_10

Exploring Materials: Memory Metal (NanoDays 13, 14)

http://nisenet.org/catalog/programs/exploring_materials - memory_metal