

A Note About Safety

The Materials World Modules were designed with safety and success in mind. We recommend that you make safety a central learning objective of each module. For the Smart Sensors module, students need to be aware of the hazards of working with sensitive electrical and electronic equipment. Safety tips about working with such equipment are provided in the Planning Guide before each Activity and Design Project.

Before beginning each Activity or Design Project, ask students to read the procedure. Then, let students raise safety issues that might come up and discuss ways they can keep themselves and others safe. You can find possible prompts for such a discussion in the Planning Guide. As an alternative, or in addition, you could provide students with a safety statement (possibly generated by the students themselves) before they begin each Activity.

Review how to use safety equipment, such as eye protection, gloves, and a fume hood, if this equipment is required for the procedure.

Finally, where safety is concerned, you are your students' best role model. By following the guidelines you have established, you can show students how the Activities and Design Projects can be fun, exciting, and safe all at the same time.

Resources on Smart Sensors

Books on Smart Sensors

Fraden, Jacob. *AIP Handbook of Modern Sensors: Physics, Designs, and Applications*. New York: American Institute of Physics, 1993.

Hauptmann, Peter. *Sensors: Principles and Applications*. Hertfordshire, England: Prentice Hall International Ltd., 1993.

Articles and Other Literature on Smart Sensors

Excellent background reading on piezoelectricity and sensors can be found in many encyclopedias under coverage of transducers. For example, *Encyclopaedia Britannica* covers piezoelectric transducers and other sensors in its detailed "Automation" and "Electronics" articles as well as individually under the headings piezoelectricity, transducers, and sensing element.

Amato, Ivan. "Fantastic Plastic." *Science News*, Vol. 136 (Nov. 18, 1989), pp. 328–329.

—"Smart As a Brick." *Science News*, Vol. 137 (Mar. 10, 1990), pp. 152–155.

Ashley, Steven. "Smart Skis and Other Adaptive Structures." *Mechanical Engineering*, Nov. 1995, pp. 76–81.

Brownridge, James D., et al. "Cryogenic Pyroelectricity: Demonstrating a Newly Discovered Phenomenon in the Classroom." *The Physics Teacher*, Oct. 1990, pp. 482–483.

Cantrell, Tom. "Kynar to the Rescue." *Circuit Cellar Ink: The Computer Applications Journal*, Issue 22 (Aug./Sept. 1991), pp. 1–6.

Chatigny, J. Victor, and Edward Tom. "Novel Switch Ideas." *Design News*, Nov. 23, 1987, pp. 158–164.

Ormond, Tom. "Smart Sensors Tackle Tough Environments." *EDN*, Oct. 14, 1993, pp. 35–38.

Sweeting, Linda M. "Light Your Candy." *Chem Matters*, Oct. 1990, p. 10.

Internet Links

<http://www.amp.com/sensors/index.html>
Information on piezoelectric film and various applications.

<http://www.piezo.com/index.html>
Piezo engineering products, educational information (for instance, an article

on the history of piezoelectricity technology), and descriptions of various applications.

<http://www.edocorp.com/indust/ceramics/products/ceraprod.html>

Explanation of how piezo elements are incorporated into devices, medical applications, and vibration control applications for machinery and aircraft, plus an article on piezoceramic technology.

Support for Teachers Using the Modules

The team of scientists, educators, and teachers putting the Materials World Modules together is committed to providing support for teachers who adopt the modules. If you have questions or comments, contact:

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