

Thermodynamics of a Rubber Balloon

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This study aimed to investigate thermodynamic properties of a rubber balloon including hysteresis and cooling effect of a deflated balloon. Firstly, pressure inside a balloon was measured using a Vernier pressure sensor and plotted as a function of the balloon averaged radius. Well-known mathematical models of inflated balloon including Mooney-Rivlin, Ogden and Gent-Gent models were used to fit experimental data. Secondly, hysteresis of pressure-stretch curve was investigated and it was found to depend on a turnaround radius. Thirdly, surface temperature of the balloon was investigated by using a Vernier surface temperature sensor. As a result when the balloon was deflated, temperature could decrease more than 5°C depending on the initial radius and balloon thickness. These results can be used to develop teaching materials or demonstrations for an introductory or advanced thermodynamics course.

Primary author: PRASONGSRI, Piimonpun (Department of Physics and Material Science, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand; Physics Education Research Laboratory, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand)

Co-author: WATTANAKASIWICH, Pornrat (Department of Physics and Material Science, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand; Physics Education Research Laboratory, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand)

Presenter: PRASONGSRI, Piimonpun (Department of Physics and Material Science, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand; Physics Education Research Laboratory, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand)

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