Candy Glass Workshop for 2012 AAPT Meeting

February 5, 2012 1-4 p.m. Cal Poly
W38: Sweet Labs in Physics and Optics with Candy Glass

Introduction:
Glass is seldom discussed in our study of matter, yet it is one of the most ubiquitous materials in our everyday life and provides numerous applications in optics, devices and materials. In this workshop we provide an introduction to glass science for the teacher through a series of low cost experiments with candy glass, a.k.a. hard candy. Experiments will include the making of candy glass, preparing optical fibers, measuring refractive index, exploring polarization and crystallization - all with commonly available materials and minimal cost. The experiments can be tailored for use in the classroom demonstration or student labs from middle school through high school or even college labs. Additional material will be available on our website at http://www.lehigh.edu/imi/libraryglassedu.html

Outline:
Introduction to Glass and Glassy State ***(****40 mins)*
Discussion 1: Introduction: ubiquity of glass, melting behavior, structure and how to see it using polarizers for structure & crystals, including optics, refractive index & fiber optical communications *(Lecture 1 slides 1-8)*
Discussion 2: **Applications of Glass** *(Lecture 1 slides 10-end)*

Experiments with Candy and Other Glasses
Discussion 3: Candy Glass Basics and our Hands-on Approach to Glass Science - 15 minutes *(Lecture 2 slides 1-7)*
Making of Candy Glass and Molding *(30 mins)*
Fiber Drawing Tower *(15 mins)*
Break (~ 3 p.m.)

Discussion 4: Additional hands-on experiments – from the IMI *(Lecture 2 slides, 8-end)*

Participant Experiments:
- Polariscope Construction and Investigations (several items to explore)
- Making of Candy Glass and Molding
- Fiber Drawing Tower
- Pfund's Method
- Gem Refractomer and Index of Common Glasses

More Advanced Experiments *(time for discussion only):*
- Crystallization from melt
- Crystallization with humidity
- Glass Transition and DTA
- Elect conductivity in candy glass

List of Resources for 2012 AAPT Workshop
(www.lehigh.edu/imi/glassedu/aapt2012workshop.pdf)

General: **ALL information available on IMI-NFG** website (www.lehigh.edu/imi) with subpage **Glass Education Resources for Students & Teachers** (www.lehigh.edu/imi/libraryglassedu.html)

Discussion Slides at the AAPT 2012 Winter Workshop:
Lecture 1: Introduction to Glass (www.lehigh.edu/imi/docs_edu/AAPT2012_01_Intro.pdf)
Lecture 2: Experiments with Candy and Other Glass
(www.lehigh.edu/imi/docs_edu/AAPT2012_02_Expts.pdf)

Building a Low Cost, Hands-on Learning Curriculum for Glass Science and Engineering Using Candy Glass Paper presented at the special education symposium of 2009 MRS Meeting (Boston) providing a 20 page summary of our experiments.
(www.lehigh.edu/imi/docs_edu/Heffner_MRSProceedings_2009_CandyCurr.pdf)

Experiments and Procedures
CandyGlassRecipe.pdf (www.lehigh.edu/imi/pdf/CandyGlassRecipe.pdf)
Candy Glass Fiber Drawing Tower
(www.lehigh.edu/imi/docs_edu/DrawingTowerHandout.pdf)
Polariscope Construction and Examining Structure
(www.lehigh.edu/imi/docs_edu/PolariscopeExaminingStructure.pdf)
Pfund's Method (www.lehigh.edu/imi/docs_edu/RefractiveIndexPfundsMethod.pdf)
Gem Refractometer and Index of Common Glasses
(www.lehigh.edu/imi/docs_edu/GemRefractometerMeasurements.pdf)

Other Related Home-built Glass Science
Differential Thermal Analysis (DTA) Presentation from the AAPT 2011
(www.lehigh.edu/imi/docs_edu/DTA_AAPT_2011_10min.pdf)
Low-cost, Data Logging Platform Poster from AAPT 2011
(www.lehigh.edu/imi/docs_edu/StampPoster_AAPT_2011.pdf)
How to Build a Simple Heater from Household Items
(www.lehigh.edu/imi/docs_edu/How2Build_SimpleHotStage.pdf)
Crystallization in Sugar Glass and Its Melts -Low Cost Experiments in Glass
(www.lehigh.edu/imi/docs_edu/Crystallization_GOMD2010_final.pdf)
Low-cost Electrometer for Measuring Conductivity in Sugar Glass Poster
(www.lehigh.edu/imi/docs_edu/Electrometer_AAPT2012.pdf)