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LEMAITRE

Team Project

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Flow Visualization 2011

I. Set up

For this third Team Project, I first wanted to work with a high speed camera and try to catch something blowing up. However, one day I was drinking lemonade eating raisins (excellent against cholesterol) and after a while I noticed a thing “dancing” in my glass: a raisin had fallen into the lemonade and was rising up and down all the time. It looked funny, so I decided to look for further information on the phenomenon. I found that a funny experiment could be done with this, by just adding raisins into lemonade.

The phenomenon is indeed the bubbles fixing onto the raisins. When enough gas is “attached” to the raisin, it rises up to the surface. Once it reaches the top of the liquid, some bubbles pop and the quantity of gas becomes insufficient to support the mass of the raisin, and it falls down. Then, other bubbles come onto the raisin and the phenomenon starts again. This experiment can work with any small thing you put into a gasified liquid. However, raisins allow more area for the bubbles to fix in. I could have used peanuts for instance, but their smooth surface would have made the phenomenon less visible.

I tried to take a video with lemonade at first. But I thought the phenomenon did not last enough longer. I found that mixing water and baking soda, and adding vinegar in it produced CO_2 . So I tried this, and it worked very well. Depending on the quantity of baking soda and vinegar, you can create more or less gas. This is an instantaneous reaction, and depending on the quantities the raisins start moving really soon.

I tried also to pour food coloring into the mixing, since I thought the raisins rising to the top would drag some food coloring into their path. Unfortunately the reactions in the liquid were too intense and the food coloring mixed too quickly so the expected “dragging” effects were not very well visible. I tried so to put less baking soda, to have less bubbles, but in this case the raisins were not rising quickly enough so the time a raisin rise the food coloring was already almost totally mixed into the liquid. So I just decided to forget this idea.

II. Physics

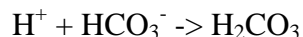
The chemical reaction is indeed composed of two reactions: an acid base reaction followed by a decomposition reaction. Baking soda (NaHCO_3), separates into sodium (Na^+) and bicarbonate ions (HCO_3^-) when put in water:



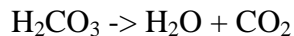
On the other hand, vinegar, a weak solution of acetic acid dissociates in water into hydrogen (H^+) and acetate ions (CH_3COO^-):



When baking soda in water is mixed with vinegar, the hydrogen ions from the vinegar react with the bicarbonate ions to form carbonic acid:



The carbonic acid then decomposes into carbon dioxide gas and water:



This is the CO_2 that forms the bubbles you see in the video.

III. Video and Music Realization

I used Sony Vegas Pro X to realize the video. This software is similar to Adobe Premiere. For this last project, I wanted to try to create my own music. I did so with the software FL Studio (formerly Fruity Loop). It allows you to create your own music, with many pre-registered sounds and instruments. I tried to create a music that suited the video, and I had many comments saying that the music was great with the video, so for a first attempt I am quite satisfied with the result.

I think this is funny to see those raisins dancing like that, and it brings some humor to flow visualizations. Such a simple and curious phenomenon is mostly unknown although it can be made with everyday life products.