The science behind the fizz: How the bubbles make the beverage

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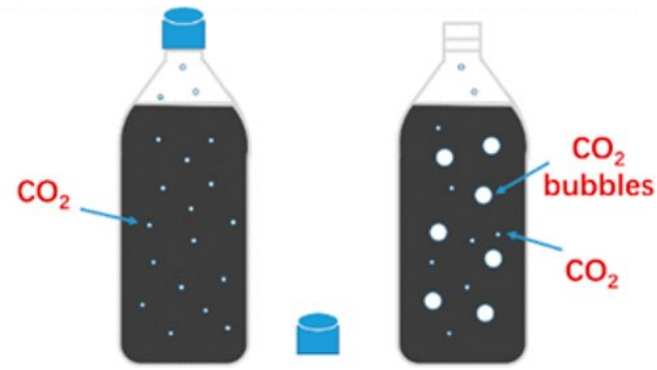

Credit: American Chemical Society

From popping a bottle of champagne for a celebration to cracking open a soda while watching the Super Bowl, everyone is familiar with fizz. But little is known about the chemistry behind the bubbles. Now, one group sheds some light on how carbonation can affect the creaminess and smoothness of beverages, as reported in ACS' *The Journal of Physical Chemistry B*.

Carbonated beverages are popular, with dozens on the market in the U.S. But very little is known about how the carbon dioxide in them interacts with the drink when it is cracked open. Previous studies have focused on alcoholic beverages and have reported findings on how the carbon dioxide bubbles rise and pop. In addition, scientists have noted that hydrogen bonds within the beverage solution are impacted by additives and other components in the water used in the process. Yakun Chen, Ji Lv and Kaixin Ren wanted to see how drink additives such as sugar, salt and added flavors affect the carbon dioxide and ultimately, the taste of the drink.

The team studied how different flavorings affected the carbon dioxide in champagnes, cola drinks and club sodas by setting up simulations. The group first examined how fast carbon dioxide diffused within each solution. They found that additives like alcohol, table sugar or baking soda would reduce the rate of diffusion, to an extent, which would leave soda fizzy for a longer period of time. The researchers also noted that the simulations showed that as carbon dioxide interacts with additives like sugar, it also interacts with the water that makes up the majority of these beverages. When a drink additive was incorporated, the team noticed that the number of hydrogen bonds decreased with their simulation, ultimately impacting the taste of the drink.

More information: Ji Lv et al. CO2 Diffusion in Various Carbonated Beverages: A Molecular Dynamics Study, *The Journal of Physical Chemistry B* (2018). DOI: 10.1021/acs.jpcb.7b10469

Abstract
Carbonated beverages are widely enjoyed in spare time, yet there remain many physical and chemical processes clouded at the molecular level. In this report, we employ molecular dynamics simulations to estimate the diffusion coefficients of CO2 and the molecular origin of its variations in three model systems with characteristic features of champagnes, sugar-based cola drinks, and club sodas. The computed diffusion coefficients of CO2 are in good agreement with experimental data. Analyses of hydrogen bonding and the solvent's structural and dynamic properties reveal that the change of CO2 diffusion coefficient is closely associated with the diffusional behavior of the solvent water itself, as a result of changes in the number and strength of hydrogen bonding interactions among the species and solvent.

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