Access to the Study of Rapid Chemical Kinetics by Generating and Monitoring a Drop of a Reaction Mixture

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The study of rapid chemical kinetics is limited by the homogenization time of the reaction mixture. In our schools, we can study transformation periods whose characteristic time is of a few minutes at best. The project is to use a drop of mixture as a chemical reactor to reduce homogenization time and access faster kinetics. Our earlier research has led us to study a drop of fluid in the air, and build an electronic device to accurately determine the size of a drop of mixture and study its detachment process during its formation phase. The drop is subjected to surface tension forces that become all the more dominant as its size decreases. Then, to determine the surface tension of a fluid, we have adapted Thompson's algorithm and developed our own IT tool. In a carrier phase, moving at constant speed, we can observe along a tube the evolution of the chemical reaction in a millimetric drop. The device allows to study reactions and determine characteristic times of a few seconds only. The performance of the device can be improved with more modern techniques which make it possible to form smaller drops, obtain a faster homogenization and thus study ever faster kinetics. On top of their didactic potential, such devices pave the way for the development of new faster data-acquisition tools and allow researchers to cut costs when expensive reactive chemicals are used.

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