OC-18

MICROWAVE CHEMISTRY IN EDUCATION

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Science education in Japan today has a lot of problems, such as poor interest of students in science, lack of teaching skills in experimental work, lack of experimental time in the curriculum, lack of financial supply for experimental equipment and etc. Microwave chemistry is useful for quick and easy experiments, which attracts students' interest in chemistry as well as in science. Here we report teaching aids using microwaves, and outlook for microwave chemistry in science and technology education. Microwave chemistry, in which a radio wave and chemistry joint, develops a new field of chemical education as follows:

1. Frontier material production focused on green chemistry through sustainable earth friendly chemical technique.
2. Materials synthesized at high efficiency with rapid experimental technique.
3. Safety: electric safety and safety against microwave leakage.
4. Knowledge of interaction of a radiation wave and materials in relation to microwave heating, and to selectivity for microwave irradiation is essential for microwave chemistry.

Several educational scenarios for chemical or science education are proposed.

A. Educational scenarios for elementary school classes and citizens.

1. Basis of microwave oven: What is microwave? 12 cm wave length, 2.45 GHz (GHz = 10^9 Hz, 60 or 50 Hz for daily use).
2. How substance is heated in microwave oven? Marshmallows (sweet) in MW oven: observation of microwave distribution in MW oven. Water and dry ice: selective heating.
3. Dry flower made in microwave oven.
4. Glass work in MW oven with Kiln: melting properties of glass: why is glass heated so hot?

B. Teaching materials for high school and university students.

1. MW synthesis with MW oven.
2. Safety for microwave experiments using microwave oven.
3. MW experiments with perforated microwave oven.
4. Rapid MW synthesis of luminescent materials.

C. Introduction to frontier studies of science and technology for university students and engineers.

1. MW synthesis of metal complexes (metal: unknown, ligand: unknown).
2. Purification and crystallization of metal complexes (single crystal).
3. Analysis of metal ion in the complexes by fluorescent X-ray method.
4. Molecular structure analysis of metal complexes and ligand by X-ray method.
5. Measurement of absorption and emission spectra of phosphorescent metal complexes.
6. Identification of unknown samples and discussion.