New Teaching Tools for a Modern Representation of Chemical Bond in the Course of Food Science

Authors : Nicola G. G. Cecca

Abstract : In Italian IPSSEOAs, high schools that give a vocational education to students that will work in the field of Enogastronomy and Hotel Management, the course of Food Science allows the students to start and see food as a mixture of substances that they will transform during their profession. These substances are characterized not only by a chemical composition but also by a molecular structure that makes them nutritionally active. But the increasing number of new products proposed by Food Industry, the modern techniques of production and transformation, the innovative preparations required by customers have made many information reported in the most wide spread Food Science textbooks not up-to-date or too poor for the people who will work in catering sector. Often Authors offer information aged to Bohr's Atomic Model and to the 'Octet Rule' proposed by G.N. Lewis to describe the Chemical Bond, without giving any reference to new as Orbital Atomic Model and Molecular Orbital Theory that, in the meantime, start to be old themselves. Furthermore, this antiquated information precludes an easy understanding of a wide range of properties of nutritive substances and many reactions in which the food constituents are involved. In this paper, our attention is pointed out to use GEOMAG™ to represent the dynamics with which the chemical bond is formed during the synthesis of the molecules. GEOMAG™ is a toy, produced by the Swiss Company Geomagword S.A., pointed to stimulate in children, aged between 6-10 years, their fantasy and their handling ability and constituted by metallic spheres and metallic magnetic bars coated by coloured plastic materials. The simulation carried out with GEOMAG™ is based on the similitude existing between the Coulomb's force and the magnetic attraction's force and in particular between the formulae with which they are calculated. The electrostatic force (F in Newton) that allows the formation of the chemical bond can be calculated by mean Fc = kc q1 q2/d2 where: q1 e q2 are the charge of particles [in Coulomb], d is the distance between the particles [in meters] and kc is the Coulomb's constant. It is surprising to observe that the attraction's force (Fm) acting between the magnetic extremities of GEOMAG™ used to simulate the chemical bond can be calculated in the same way by using the formula Fm = km m1 m2/d2 where: m1 e m2 represent the strength of the poles [A•m], d is the distance between the particles [m], km = μ/4π in which μ is the magnetic permeability of medium [N•A-2]. The magnetic attraction can be tested by students by trying to keep the magnetic elements of GEOMAG™ separate by hands or trying to measure by mean an appropriate dynamometric system. Furthermore, by using a dynamometric system to measure the magnetic attraction between the GEOMAG™ elements is possible draw a graphic F=f(d) to verify that the curve obtained during the simulation is very similar to that one hypnotized, around the 1920's by Linus Pauling to describe the formation of H2+ in according with Molecular Orbital Theory.

Keywords : chemical bond, molecular orbital theory, magnetic attraction force, GEOMAG™
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