

On radio-active isotopes and dating problems (2)-On the mass analysis of isotopes-

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Internal structure of the atom that appears as Stern-Gerlach and Stark effects that can diverge the path of ion beams will make the mass spectrometry analysis of isotopes extremely difficult. Clustering of particles as well as dead time corrections are also uncertain factors in the mass analysis of isotopes (Ouch, 2008). Further, for such particles subjecting Lorentz forces, uniform magnetic field is no longer homogeneous. None of these problems can be ignored. These too many difficulties make situations of isotopes more confusing and not a little ambiguities are left.

Historically, it is thought the concept of isotopes was established by Thomson J.J. and other scientists in 1921. However, this is not the case. Thomson objected this. His arguments are as follows: the electric charge of the atom is unchanged but change of mass distribution will induce the change of configuration in the atom. This residual effect would not be large but might produce some difference between chemical or physical properties of the isotopes. It would affect the distance of the outer layer from the core of the atom differences in the distances of this layer from the center may result in different chemical properties. Also he implied the possibility of hydrogen compounds for neon isotopes while he presented the seminal idea of isotopes in 1913.

Of most importance in his arguments is the concept of caustics that show edges or envelopes of ion beams and are important in the interpretation of bright lines of mass spectra. If we analyze bright lines of mass spectra as caustics, results differ with those following the ordinary ray theory. Situations of isotope anomalies that appear in meteorite and volcanic rocks might manifest this situation. We can see some example arises from this problem in a text book by Finkelburg (1976). Each indication by Thomson is quite accurate.

Basic problem may be attributed to the mass spectrometry analysis of isotopes and the concept of isotopes principally relies on the mass spectrometry, where we find various difficulties mentioned above. It is noted that very few is dealt in a comprehensive review of atomic and molecular beams (ed. Scoles,1988). We should take into consideration chemical nature of the atom (chemical atom) and various uncertainties in the analysis of isotopes when we use isotopes for aging of rocks and the other purposes in earth sciences.