2O07

Mass formulas on the viewpoints of chemistry

化学的観点から見た質量式

Previously, Hokkaido Univ. Graduate School

元北大大学院理学研究科・地球環境科学研究科

Hideyuki NARUMI　　　鳴海　英之

(nrhd2357@gray.plala.or.jp)

1.Introduction

Koide gave the precise mass formula(MF) for charged leptons(Ref.1). Sogami and Brannen also gave cosine-type MFs for quarks and leptons respectively (Ref.2 and 3).

We presented also the cosine-type MF for 3 generations of neutrino, charged lepton, d-quark, and u-quark. (Refs. 4 and 5).

2. Results and discussions

We assume that quarks and leptons are composed of preons which are physical or mathematical existences, and assume that preons are described by a Schroedinger-type equation:

$$H\Psi = \lambda\Psi, ...(1), \Psi = \sum_{l=1}^{3,4\,or12} c_l \phi_l, ...(2), \lambda \equiv \sqrt{m} = \langle \Psi H \Psi \rangle / \langle \Psi\Psi \rangle, ...(3).$$

,where H is an operator, Ψ a total wave function, ϕ_l a wave function of a preon, λ an eigenvalue which is the root of mass(root-mass).

We assume that a lepton or quark is composed of 4 preons which are on a line in the cases of root-masses of 1st and 2nd generations, and, which are from on a line to on a cycle in the cases of root-masses of 3rd generation and a average root-mass of each sector .

We gain an unified MF from the above assumptions as:

$$\lambda(l,n) = \mu(l,average)\Lambda(l,n), ...(4)$$

$$\Lambda(l,n) \equiv 1 + 2\eta(l)\cos(\Delta(l) + 2n\pi/3); \eta(e\mu\tau) = \sqrt{2}/2; \eta(dsb) = 0.76; \eta(uct) = 0.88;$$

$$\Delta \equiv (2/9)/N(l); N(e\mu\tau) = 1; N(dsb) = 2; N(uct) = 3, ...(5).$$

$$\mu(l,average) = 114.5[1 - 2\times 0.5\cos(-6/5 + l\pi/5)]; l = 1\, for\, \mu(e,\mu,\tau) = 18.2;$$

$$l = 2\, for\, \mu(ve, v\mu, v\tau) = 0.18; l = 3\, for\, \mu(d,s,b) = 25.9; l = 5\, for\, \mu(u,c,t) = 156.6,$$

$$(Mev^{0.5}), ...(6).$$

$\eta(\nu)$ and $N(\nu)$ are depend on theories of neutrinos. If μ is given from the above eq.(6), two parameters η and Δ decided from two empirical masses give the 3rd calculated mass.

The quantities η and Δ for each sector are expressed as from eq. (4):

$\eta^2 = -1/2 + (3/2)[\lambda_1^2 + \lambda_2^2 + \lambda_3^2]/[\lambda_1 + \lambda_2 + \lambda_3]^2$,.....(7).

$[(\lambda_2/\lambda_1)\cos(\Delta + 2\pi/3) - \cos(\Delta + 4\pi/3)]/[(\lambda_3/\lambda_2)\cos(\Delta + 4\pi/3) - \cos\Delta]$
$= (1 - \lambda_2/\lambda_1)/(1 - \lambda_3/\lambda_2)$,.....(8).

We assume also that the root-masses of the 1st, 2nd and, 3rd generations are expressed almost as same as eq.(6):

$\mu(n,k) \equiv M(n,k)[1 - 2E(n,k)\cos(D(n,k) + k\pi/5)]$,.....(9);

If 3 parameters M, E, D in eq.(9) are decided from 3 empirical masses, the 4th mass is given by calculations:

$\mu(1,k) = 1.181[1 - 2\times 0.6095\cos(-0.0192 + k\pi/5]; k = 1 for \sqrt{m(\nu e)} = 0.0;$
$k = 2 for \sqrt{m(e)} = 0.71; k = 3 for \sqrt{m(u)} = 1.6; k = 4 for \sqrt{m(d)} = 2.4$,.....(10).
$\mu(2,k) = 52.35[1 - 2\times 0.5\cos(-2\pi/5 + k\pi/5)]; k = 1 for \sqrt{m(\mu)} = 9.9;$
$k = 2 for \sqrt{m(\nu\mu)} = 0.0; k = 3 for \sqrt{m(s)} = 9.9; k = 4 for \sqrt{m(c)} = 36.2$,.....(11).
$\mu(3,k) = 280[1 - 2\times 0.5\cos(-6/5 + k\pi/5)]; k = 1 for \sqrt{m(\tau)} = 44.5; k = 2 for \sqrt{m(\nu\tau)} = 0.47;$
$k = 3 for \sqrt{m(b)} = 63.1; k = 5 for \sqrt{m(t)} = 381.4$,....(12).

Eqs. (10) and (11) stands for the graph with a line of 4 vertex and 3 edges. Eqs. (6) and (12) express changes of graphs from the above to cycles of 4 vertexes and 4 edges.

Above equations reproduce empirical root-masses in good approximations.

< References >

1)Y. Koide, Phys. Rev., D73. 057901(2006).
2)I. S. Sogami, Prog.Theor. Phys. Vol.114, 873 (2005).
3)C. A. Brannen, carl@brannenworks.com(2006).
4)H. Narumi, Meeting Abstructs of The Phys.Soc.Jpn., vol. 63, Issue 1, Part 1, p.14 (2008).
5)H. Narumi, Nippon Computer Kagakkai, 2008, Shunki Nenkai Koen Yokoshu (Tokyo Kogyo Daigaku), 1011(in English).