MIT Chemical Engineering Department

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Neutrinos and Electrons/Positrons: The Building Elements and Catalysts of Our Universe

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Abstract:

The formation of composite particles, such as protons and/or other hadrons from their constituent quarks, known as baryogenesis or hadronization, appears to have many similarities with catalytic chemical synthesis. In this talk, I will discuss similarities between these two processes and provide thermodynamic and kinetic considerations. This catalytic role in baryogenesis is played by electrons and positrons, and it is discussed in the context of the Standard Model (SM) and the recently derived Rotating Lepton Model (RLM) [1-4].

The latter is constructed based on a Bohr-type model of rotating neutrinos, where gravity is the attracting force but where special relativity is also used for the corresponding masses. The model predicts masses and other properties of hadrons with an astonishing precision of 1% without the use of any adjustable parameters. According to RLM the catalytic role of electrons and positrons is due to their gravitational mass. This leads to an acceleration of neutrinos to ultrarelativistic velocities, such that the relativistic neutrino mass reaches the quark mass, the neutrino gravitational mass reaches the Planck mass and the gravitational attraction reaches the value of the Strong Force. The result is gravitational confinement in circular orbits with radius size of the order of fm.

We will discuss the implications of these findings regarding the nature of the Strong and Weak Forces, as well as similarities and differences from classical catalysis in chemical and biological systems, and in which the catalytic action results from electrostatic interactions. Some potential aspects of power generation via controlled baryogenesis will be also discussed.

1. CG Vayenas, SN-A. Souentie, Gravity, special relativity and the strong force: A Bohr-Einstein-de Broglie model for the formation of hadrons. (Springer, NY, 2012).
2. "A Bohr-type model of a composite particle using gravity as the attractive force". C Vayenas, S Souentie, A Fokas, *Physica A*, **405**, 360-379 (2014).
3. "Catalysis & autocatalysis of chemical synthesis& of hadronization". C Vayenas, A Fokas, D Grigoriou, *Appl. Catal. B*, **203**, 582-590 (2017).
4. "Proton internal pressure distribution suggests a simple proton structure". C Vayenas, D Grigoriou, E Martino, *J Mech Beh Mat*, **28**, 1-9, 2019.