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A New Fundamental Theory from Physics to Biology

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INTRODUCTION

The theory behind the glass and glass transition problem, one of the most enduring and major challenges in physics? Recently, a preprint in scientific reports entitled "Boson and two-dimensional cluster model composed of quenching disorder eigenvalues and eigenvectors in the glass transition" provides a possible answer. The root of the glass state problem lies in the failure of existing atoms-molecules as quasi-independent particles of mean-field one-electron statistical physics, replaced by two-electron statistical physics based on the strict theory of de Gennes n=0. This is a new fundamental theory involving all molecular disciplines, including biochemical reactions, and it will be a theory that bridges physics and biology, describing from disordered to ordered to more ordered up to biomolecules. The key new concept is that in mean-field Hard-Sphere Molecular (HSM) system, in addition to phonons involved in disordered thermal vibrations of all HSMs, there are Cluster Interaction bosons (CI-bosons) involving only two adjacent HSMs. Starting from the absolute temperature, the collision satisfying de Gennes n=0 second-order delta vector condition is a clustered collision, an interface excited state of the coupled electron-pair of two adjacent HSMs emerges in the interface plane with an overlap of 0.27%, such that the two HSMs suddenly become an Ising spin state, called the Quenching Disorder Eigenvalue (QDE). It is found that the disordered system is actually just a positional disorder and the cluster-contact angle-lines projected by two adjacent HSMs onto each other are ordered and they are the inherent eigenvectors of this disordered system.

DESCRIPTION

HSM can make cluster-contact with the 16 sequentially spatial angle-line states of an adjacent HSM at constant intervals of 5.9987° along 16 spatial angle-lines, constituting of the 16 eigenvectors of the disordered system. The new Two-Dimensional (2D) interface-plane vector formed by the 16 QDEs appearing sequentially is a Cluster-Interaction boson (CI-boson), depicting the hopping mode of two positively charged particles (M ± Ps) in two overlapping HSMs, with two synchronous-anti-symmetrically coupled M ± Ps jumping 15 consecutive steps at tiny 0.01-step intervals along two orthogonal diagonals. The CI-boson is a unit interface for constructing 2D clusters at the bottom of the lennard-jones potential well. Four bosons that appear sequentially around the z-axis form the smallest 2D dynamic five-HSM cluster, in the form of a dynamic cubic lattice/equilateral hexahedron around the z-axis, called the mean field z-axis HSM interface excited spin. Therefore, the cluster model starts from the absolute temperature and accumulates CI-bosons excited by clustered collisions to form 2D clusters at different scales. More and more eigenvalues in local domain appear sequentially with temperature, so the potential energy of eigenvalues in the growing 2D cluster is always in equilibrium with the increasing disordered kinetic energy in 3D space. This is a cluster model of two-electron approach without kauzmann paradox. The largest 2D cluster is the soft matrix spin system of n=0, whose directed eigenvalue potential energy is equal to the glass transition temperature energy of kBTg. The five fundamental properties of CI-bosons provide new perspectives on various phenomena and terminology occurring in soft matter systems, such as molecular interfaces, cavities, exclusion volumes, cages, jamming particles, pinning particles, fast-slow relaxation, heterogeneity, potential energy landscapes, entropy change, activation energies and so on.

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Thus, the core concept of soft matter created by de Gennes will be CI-bosons between adjacent two-molecules described by de Gennes n=0 theory and 2D soft matrices constructed from CI-bosons. Each molecular system has its own CI-bosons and cluster models and the common denominator is that we only need to look for the space-time ordered structure of all positively charged particle pairs and all coupled electron-pair interface excited states in the molecular system. The image of the soft matrix is shown below. The central cavity of a +z-axial soft matrix is a +z-axial vector that connects all z-axial eigenvalues (coupled electron pair z-axial interface-excited states) of all 320 bosons in the soft matrix, which is a vector that drives the 200 HWMs in the soft matrix to jump together along the +z-axial direction. The positively charged central particles (M ± Ps) of all HSMs in the soft matrix must be at the 1/16 equipotential sharp-angle singularities and all negatively charged CI-bosons must be at the bottom of the potential well. When the soft matrix disappears, the equilibrium position of the positive and negative charges in the soft matrix is at the point nz between 0 and 1/16, so all 200 HSMs projected into the z-direction jump together nz-steps in the z-direction, where nz ≤ 0.036, less than the vibration amplitude of the covalent bond 0.1. The image of the glass transition is that all HSMs in each local area choose only a projection in a certain direction, that is, the chains with a chain length of N only the HSMs in the z-component chain can form a 2D soft matrix in the z-direction. The glass transition is a critical phenomenon in which only one soft matrix appears on average in each local area, but all N soft matrices that have been excited and will be excited are associated, which is a solitary wave pattern that jumps nz-steps in the same z-direction sequentially. CI-boson is also a pathway that describes the chemical reaction between two electrons in two adjacent molecules that escape from the two HSMs to the interface of the two molecules, which predicts that the biochemical reaction must be chemically orthogonal physics described by the theory of n=0. CI Boson shows that glass transition is the convergence of kinetics and thermodynamics and this conclusion may also change our understanding of chemical reaction kinetics.

CONCLUSION

The chemical reaction is not a reaction between two molecules, but the renewal process of the two soft matrices of two groups of molecules in the chemical reaction and this update process itself will be seen as a new and larger soft matrix in n=0 theory. Thus, continuous chemical reactions in biology in the theory of n=0 will be seen as the evolution of continuous CI-bosons and the generation of ordered space-time structures in continuous soft matrices. Progress in glass state theory shows that the spin direction of macromolecular chains is determined by the selection of HSM at the traveling end of the chain and when the symmetry of this selection is broken, it may be the origin of biological chirality, *i.e.*, the HSM interface excitation spin points the way to explore the origin of biological chirality.