International Journal of Current Science Research
www.drbgrpublications.in

IP Indexing - Impact factor – 3.5
Volume: 3; Issue: 6; June-2017; pp 1277-1282. ISSN: 2454-5422

Statistical interpretation of Einstein's particle diffusion

A.Veerapandiyan*

Assistant Professor, Department of Physics, Nehru Memorial College (Autonomous), Puthanampatti, India.

*Corresponding Author E-mail: mathscien@gmail.com

Abstract

Diffusion of particles in the space is changing much the dynamical characteristics of state of matter within the system and this was used to find the exerting level of force on the particles of the system. The diffusion rate is depending on the force gradient of the particle dynamics in the space and size of the mass and nature of the time and rate of energy. The dynamics of the system was observed in the interfacial exchange of particle distribution with the separation of distance dx.

Keywords: Diffusion, Expectation value, Gaussian distribution

Introduction

Here was realized much about the dynamics of deterministic one measured statistically in deterministic view. The deterministic one behave in deterministic and in deterministic behave deterministic this is the beauty of nature we could experienced in that way of Einstein foundation of physical thinking of nature. In this article was inferred suitably the relation of quantum particle dynamics and this flow rate in the space time with the help of statistical observation of findings of particles.

Results

The nature of dynamical relation of particles was observed in the sense of diffusion equation. The nature of the diffusion level will be varying nature of the energy-mass conservation in the space -time. The nature of the dynamical characteristics would be observed here by the chance and selection of fundamental physical parameter of nature.

Discussion

$$\int_{-\infty}^{\infty} \Phi(\mathrm{x})\mathrm{dx} = 1$$

Finding the variance, $\sigma^2 = \int_{-\infty}^{\infty} (\mathrm{x} - \mu)^2 \Phi(\mathrm{x})\mathrm{dx}$

σ^2 Is the expectation value for creation of events in the space. We take the equivalently $\sigma^2 = |\psi|^2$.

$|\psi|^2$ - is the finding the wave function and the space $\int_{-\infty}^{\infty} |\psi|^2 \mathrm{dx\ dy\ dz}$.

$$\int_{-\infty}^{\infty} \psi\psi^* \mathrm{dx\ dy\ dz} = \int_{-\infty}^{\infty} \psi\psi^*\, d^3x$$

The space and matter representation is might be associate the force which leads the flow representation in the space.

$$\int_{-\infty}^{\infty} \Phi(\mathrm{x})\mathrm{dx} = I(\max)$$

$$f(x, t + \tau)dx = dx \int_{-\infty}^{\infty} f(x + \Delta)\Phi(\Delta)\mathrm{d}\Delta$$

τ-is very small,

The partial distribution of force is $f(x, t + \tau) = f(x, t) + \tau \frac{\partial f}{\partial t}$

And particle transportation distance d x,

$$f(x,t+\tau)dx = \left(f(x,t) + \tau\frac{\partial f}{\partial t}\right)dx$$

$$f(x,t+\tau) = f(x,t) + \Delta\frac{\partial f}{\partial x} + \frac{\Delta^2}{2!}\frac{\partial^2 f}{\partial x^2} + \cdots$$

$$f(p-\delta p, t+\tau) = \frac{d\rho(r)}{dt} + \frac{\partial\rho(r)}{\partial x}\delta x$$

$$p - (\frac{\partial p}{\partial x}\delta x) = \frac{d\rho}{dt} + V(r)$$

Multiply both sides d x, d y and d z,

$$(p-\delta p)dx\,dy\,dz = \frac{d\rho}{dt}dx\,dy\,dz + V(r)dx\,dy\,dz$$

$$T - V(r) = \frac{d\rho}{dt}dx\,dy\,dz$$

$$f(x,t+\tau) = T - V(r)$$

$$f(x,t) + \tau\frac{\partial f}{\partial t} = \int_{-\infty}^{\infty} f(x+\Delta)\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial f(x+\Delta)}{\partial x}\int_{-\infty}^{\infty}\Delta\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial^2 f(x+\Delta)}{\partial x^2}\int_{-\infty}^{\infty}\frac{\Delta^2}{2!}\Phi(\Delta)\mathrm{d}\Delta + \cdots$$

Finding the variance of two side gradient transformation of matter in the space is,

$$f(x,t+\tau) = f(x,t) + \tau\frac{\partial f}{\partial t}$$

$$f(x,t) + \Delta\frac{\partial f}{\partial x} + \frac{\Delta^2}{2!}\frac{\partial^2 f}{\partial x^2} + \cdots = \int_{-\infty}^{\infty} f(x+\Delta)\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial f(x+\Delta)}{\partial x}\int_{-\infty}^{\infty}\Delta\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial^2 f(x+\Delta)}{\partial x^2}\int_{-\infty}^{\infty}\frac{\Delta^2}{2!}\Phi(\Delta)\mathrm{d}\Delta + \cdots$$

Then equate the form of Lagrange equation,

$$f(x,t+\tau) = T - V(r)$$

$$T - V(r) = f(x,t) + \Delta\frac{\partial f}{\partial x} + \frac{\Delta^2}{2!}\frac{\partial^2 f}{\partial x^2} + \cdots$$

$$= \int_{-\infty}^{\infty} f(x+\Delta)\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial f(x+\Delta)}{\partial x}\int_{-\infty}^{\infty}\Delta\Phi(\Delta)\mathrm{d}\Delta$$

$$+ \frac{\partial^2 f(x+\Delta)}{\partial x^2}\int_{-\infty}^{\infty}\frac{\Delta^2}{2!}\Phi(\Delta)\mathrm{d}\Delta + \cdots$$

The total transformation of diffusing particles per unit smallest time τ

$$\frac{\left(T - V(r)\right)}{\tau} = \frac{1}{\tau}(f(x,t) + \Delta\frac{\partial f}{\partial x} + \frac{\Delta^2}{2!}\frac{\partial^2 f}{\partial x^2} + \cdots$$

$$= \int_{-\infty}^{\infty} f(x+\Delta)\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial f(x+\Delta)}{\partial x}\int_{-\infty}^{\infty}\Delta\Phi(\Delta)\mathrm{d}\Delta$$

$$+ \frac{\partial^2 f(x+\Delta)}{\partial x^2}\int_{-\infty}^{\infty}\frac{\Delta^2}{2!}\Phi(\Delta)\mathrm{d}\Delta + \cdots)$$

$$W = \frac{\left(T - V(r)\right)}{\tau} = \frac{1}{\tau}(f(x,t) + \Delta\frac{\partial f}{\partial x} + \frac{\Delta^2}{2!}\frac{\partial^2 f}{\partial x^2} + \cdots$$

$$= \int_{-\infty}^{\infty} f(x+\Delta)\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial f(x+\Delta)}{\partial x}\int_{-\infty}^{\infty}\Delta\Phi(\Delta)\mathrm{d}\Delta$$

$$+ \frac{\partial^2 f(x+\Delta)}{\partial x^2}\int_{-\infty}^{\infty}\frac{\Delta^2}{2!}\Phi(\Delta)\mathrm{d}\Delta + \cdots)$$

The work function is equivalent to the diffusion coefficient D (total).

$$D(total) = \frac{\left(T - V(r)\right)}{\tau} = \frac{1}{\tau}\left(f(x,t) + \Delta\frac{\partial f}{\partial x} + \frac{\Delta^2}{2!}\frac{\partial^2 f}{\partial x^2} + \cdots\right.$$

$$= \int_{-\infty}^{\infty} f(x+\Delta)\Phi(\Delta)\mathrm{d}\Delta + \frac{\partial f(x+\Delta)}{\partial x}\int_{-\infty}^{\infty} \Delta\Phi(\Delta)\mathrm{d}\Delta$$

$$\left. + \frac{\partial^2 f(x+\Delta)}{\partial x^2}\int_{-\infty}^{\infty}\frac{\Delta^2}{2!}\Phi(\Delta)\mathrm{d}\Delta + \cdots\right)$$

Well known form of diffusion equation and this inertial motion of the particles within the poly phase materials system are,

$$\frac{\partial f}{\partial t} = D\frac{\partial^2 f(x+\Delta)}{\partial x^2}$$

Here, meaningfully found the diffusion D is physically equivalent to the mathematical relation of variance,

$$D = \sigma^2 = \int_{-\infty}^{\infty} (\mathrm{x}-\mu)^2\Phi(\mathrm{x})\mathrm{dx}$$

After reduction of this diffusion equation we will get the final solution,

$$f(x,t) = \frac{M}{\sigma\sqrt{2\pi}}e^{-x^2/4Dt}$$

Then compare the diffusion equation for Gaussian distribution

$$f(\mu,\sigma^2) = \frac{M}{\sigma\sqrt{2\pi}}e^{-(x-\mu)^2/2\sigma^2}$$

Here, $\sigma^2 = 2Dt$.

Required for some correction in the distribution function from the use of $\sigma^2 = 2Dt$diffusion form,

the variant,$D = \sigma^2 = \int_{-\infty}^{\infty} 2\mathrm{t}\,(\mathrm{x}-\mu)^2\Phi(\mathrm{x})\mathrm{dx}$

Rewrite statistically,

$$D = 2t \int_{-\infty}^{\infty} \psi\psi^* \, d^3x$$

$$D = t \int_{-\infty}^{\infty} \psi\psi^* \, d^3x + t \int_{-\infty}^{\infty} \psi\psi^* \, d^3x$$

We have found the theoretically some of the results are

The first one condition which is to satisfy this $D = t \int_{-\infty}^{\infty} \psi\psi^* \, d^3x + t \int_{-\infty}^{\infty} \psi\psi^* \, d^3x$. we get this positive or outwards dynamical motion of the matter. The other one is the condition to satisfy in this mathematical structure $D = t \int_{+\infty}^{-\infty} \psi\psi^* \, d^3x + t \int_{+\infty}^{-\infty} \psi\psi^* \, d^3x$ come the flow of matter and energy inward direction. The final one is almost nothing to happen any dynamical actions within the system this would be satisfied the form of $D = t \int_{-\infty}^{\infty} \psi\psi^* \, d^3x + t \int_{\infty}^{-\infty} \psi\psi^* \, d^3x$.

Acknowledgement

A.V gives the thanks to management of our college they provide me a good library and internet facilities unless this would not happen to write it all. The same sense of my department faculties helped me a lot varies way (science discussion) comes out the article at the present level. Finally, I would like to give thanks all my teachers and family, friends and relatives, societies they supported to me all the way bring out the article very happily.

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