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THERMODYNAMICAL LAWS AND KINETICS OF THERMAL-INACTIVATION

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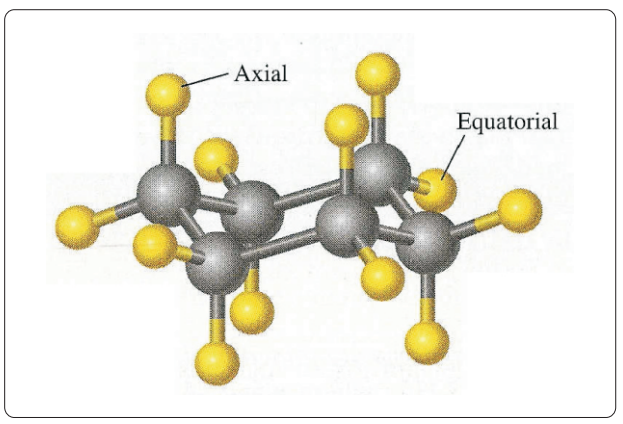
ABSTRACT

This paper presented the analysis of the fourth law of thermodynamics, the nature of the dull vitality and potential to create such a vitality. This translation depends on geometric demonstrating of space as a stage liquid and the force created when. In view of this examination and by the properties of the established thermo elements, the fourth law of thermodynamics is proposed to account for the overwhelming vitality in the universe. Such a law is critical to represent the ruling part of the universe, the 70 % dull vitality that is behind the quickened development of the universe. The effect of heat treatment on the activities of quality related.Enzymes: peroxides (POD), polyphoneoxides(PPO)etc.studied over a temperature range of 50 to 800C using mathematical analysis of the kinetic and thermodynamic parameters for the thermo inactivation of the enzymes .For peroxides in the first phase of inactivation indicates that a high amount of energy was required to initiate its de maturation, and supports why it is used as a marker for inactivation of quality-related enzymes. Analysis oof the fourth law of thermodynamics and dull vitality is proposed. Such a law introduces a clarification of the development of the universe by the negative weight produced by the energy related with as a mechanical variable.



KEY WORDS:- *Thermodynamically Dark energy ,Law of Thermodynamics, CMB ,L-CDM, Einstein's Relativity, Enzyme, MEMS,POD,PPO,LOX, Kinetics, Thermo-inactivation.*

1. INTRODUCTION

In,normal case Principles of thermodynamics are abridged in four laws.Although the principlesof thermodynamics have existed following the formation of the universe, the let go and

second laws of thermodynamics rose all the while in 1850s out of works of William Rankin, Rudolph classis furthermore, Lord Kelvin.Thermodynamicallyconcept is characterized as the investigation of vitality .it is utilized to translate all parts of vitality and vitality changes, including power eras , refrigeration, warming, what's more, connections among the properties of matter. Late galactic perceptions by the supernova cosmology venture , the High$\hat{z}$ Supernova look Team and grandiose microwave foundation (CMB) have given solid proof that our universe is growing , as well as extending at an accelerrating rate3-10. It was just in 1998 when darkenergy proposed surprisingly , after two gatherings of space experts made a survey of exploding stars , in a number of distant galaxies.[3-5]

The four laws of thermodynamics can be condensed in the accompanying explanation[1]:

A. The Zero Law of Thermodynamics:- If two bodies are in warm balance with a third body , they are additionally in warm harmony with one another.

B .The principal Law of Thermodynamics: - Energy is preserved and can just change its structure.

C. The Second Law of Thermodynamics:- It is inconceivable for any gadget that works in a cycle to get heat from a solitary supply and deliver a net measure of work .

D. The Third Law of Thermodynamics:- The entropy of an immaculate crystalline substance at outright zero temperature is zero The main clarification is that there is a sort of power that has a solid negative weight and acting outward contrary to gravitational power everywhere scales which was proposed for the first run through by Einstein in his General Relativity and given the name the cosmological constant Lambda[2].we report here more detailed analysis of the kinetics and thermodynamic parameters for the thermal inactivation of three quality related enzymes and a model for such process in the analysis of fourth law of ther odynamics and kinetics.

2. Materials and Method:-

2.1. Preparation of homogenates:- The homogenate was filtered through four layers of cheese cloth and centrifuged at 10,000xg for 20min in refrigerated centrifuge .All solutions used in the preparation of the homogenates as well as the plant Material were kept on ice .

2.2. Thermal inactivation:- The enzyme was exposed to different temperatures and at suitable interval of time . The homogenates were kept on ice until heating. Following heating, samples were cooled on cold water and stored on ice until assay.

2.3. Enzyme assays:- Assay method for polyphone oxides Activity was that of Chutintrasri and Noomhorm[11]. One unit of PPO activity is defined as a change in absorbance of 0.001/min at 400nm using 3.3mM catchall solution prepared in o.1m sodium phosphate buffer pH7.0.Lipoxygenase assay was according to the method of Anthon and Barrett,[12] one unit of enzyme activity is defined as the change in absorbance of 0.01/min under the conditions of assay.

3. Fourth Law of Thermodynamics Proposal:- "Considering times as mechanical variable, for a shut framework with moving limits made out of homogenous isotropic astronomical liquid, the framework will have a negative weight equivalent to the vitality thickness that causes the framework to grow of an

quickened rate besides the force connected with time is equivalent to the negative of the framework all out energy" .

3.1 Can Dark Energy be Generated:-Macro scale:- Galactic perception have brought the proof that dull vitality is homogenous, isotropic and consistently fills the space with a thickness - 26 3 approximate10 Kg/m .It is realized that it doesn't communicate with powers other than gravity. One joule of dull vitality is proportionate to space time circle of 64252m span. Besides, One Gega joules of dull vitality is equal to a space time circle of 642.520km span. By investigation it appears that huge articles are expected to drag sensible measures of dim vitality, for example, universes, stars or planets as appeared in Figure1. Different elements ought to be tried to examine their impact on dim vitality, for example, the rotational velocity of moving bodies and their temperatures .Objects with high rotational speeds will expand their energies and as result more dim vitality may be dragged. Enormous articles with high surface Temperatures. Objects with high surface temperatures should pull in more dim energies.

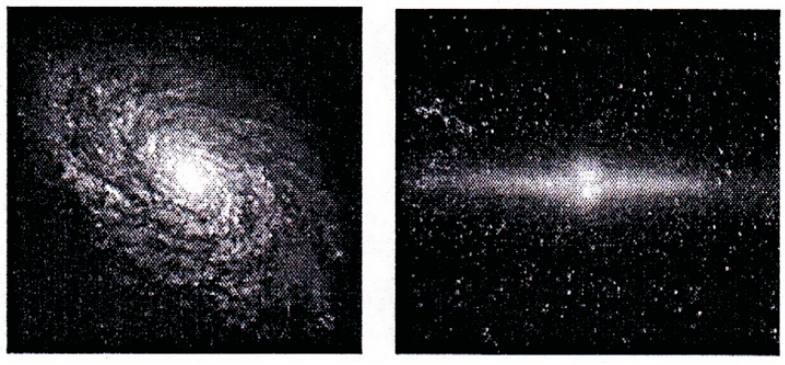


Figure 1 Spiral Galaxy And The Milky Way Galaxy (Nasa's Hubble Telescope

3.2 Micro-Scale:- Past examination depends on the full scale level. To test now the presence of dim vitality at the small scale level , the accompanying test is proposed. This framework is made out of a shut cubic box of edge length measure up to to1m and small scale cylinder barrel is then to be put inside that crate . Such a small scale cylinder chamber may be manufactured utilizing Micro-Electro-Mechanical System innovation - 26 (MEMS). The aggregate sum of dull vitality contained inside the cubic box is the scope of 10 kg which is - 9 equal to 0.90 10 Joules (or 5.625GeV). In the event that the volume of the miniaturized scale cylinder chamber is picked such 3 - 32 - 16 that it has a 1 cm , it contains a measure of vitality equal 10 kg or 9 10 Joules or 5625 eV. Presently in the event that the small scale cylinder barrel is put inside the cubic box, then the cylinder will move to one side as appeared in Figure 3. That is on the grounds that the dim vitality inside the cubic box is much higher that inside the small scale cylinder chamber. Such a removal is corresponding to the dull vitality thickness . The work of the dim vitality is "w = - Fds =-PAds as in (1).According to the standard of protection of vitality, this work 2 should be equivalent to the motor vitality of the cylinder KE =0.5m (ds) , then, ds=-2PA/m , is the cylinder p - 4 - 3 mass, if the cylinder zone is picked as A=10 ,its mass is 10 kg, and assessing the vitality weight as - 9 3 0.90x10 J/m (5.625 GeV), then the cylinder will move 0.18 nanometer. By this, it is conceivable that dim vitality can be used to work miniaturized scale or nano framework. Such framework can have a few applications in space, biomedical or gadgets application.

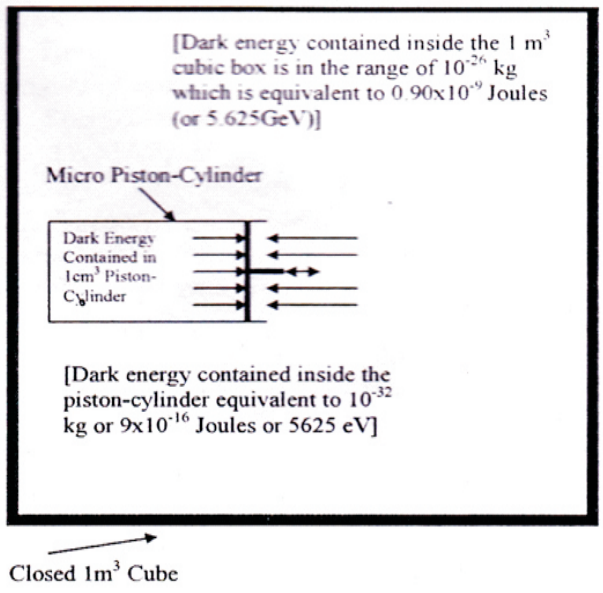


Figure 2: Micro Piston- Cylinder System to Test The Pressure Work of Dark Energy: [The piston will move by 0.18 nano meter by effect of the negative force of dark energy]

5. Simulation Result and Discussion - The reason for reenactment is to demonstrate the dim vitality related with a mechanical framework by considering time as a mechanical variable. The dim vitality is equivalent to the energy connected with time. Such vitality (negative weight) floats the framework a way. The framework is made out of 6-DOF smaller scale space robot arm and mounted on a miniaturized scale base satellite and utilized vto demonstrate the analytical results. The rate of thermal inactivation of three quality –related enzymes were measured over the temperature range 50^0C-80^0C. it was observed that the time and temperature of the heating process affected the rate of inactivation of the enzyme. The residual enzyme activities for peroxides (POD) lipoxygenace (LOX), and polyphoneoxides (PPO), are sown in figures 3(a,b,c,) respectively.

The rate constants k_1 and k_2 for the first and second phase, calculated from the slopes of plots of residual activity against time, increased logarithmically with temperature. The activation energy for inactivation, Ea were obtained from the slopes of $logk_1$ plotted against the inverse of absolute temperature (fig.3). using the Arrhenius equation $k=Ae^{-Ea/RT}$. For the first phase of the inactivation, larger values of Ea(2510kj/mol) were obtained for POD. When compared to that of 2160kj/mol, obtained for PPO. Surprisingly, the Ea values obtained for lip oxygenize (2750kj/mol) was more than that for both peroxides and polyph one oxides (Tables1,2and3).

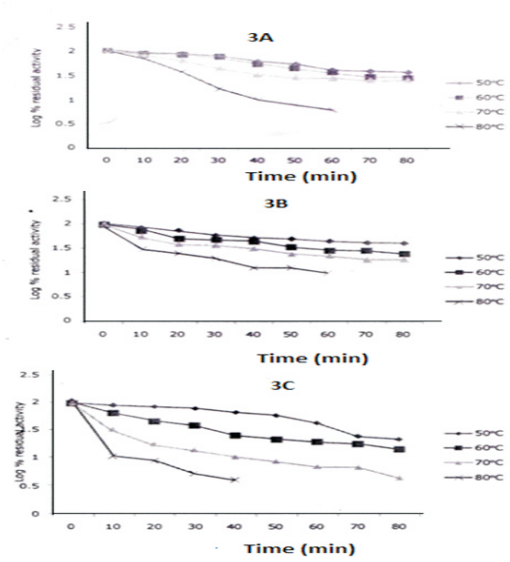


Figure3: Semilog plots showing thermal inactivation of the three quality related enzmes at different temperatures.(3a) Peroxidase (POD). (3b) Polyphenol oxidase (PPO) , and(3c) Lipoxygenase (LOX) . The enzymes in assay buffer were incubated at various temperatures. At regular intervals, aliquots were removed to measure the residual activity expressed relative to that of an unheated control.

K_1							K_2					
Tem (0C)	$t_{1/2}$ (min)	Ea (KJ/mol)	ΔG,	ΔH,	ΔS	D	$t_{1/2}$ (min)	Ea (KJ/mol)	ΔG,	ΔH,	ΔS	D
50	3.79	2510	45.8/2	-175.422	-221.24	51.2	4.14	2200	-296.98	-485.42	-188.44	72.0
60	3.40	2510	-37.29	-258.562	-221.27	34.4	3.89	2200	-380.09	-568.56	-188.47	56.2
70	2.86	2510	-120.37	-341.702	-221.30	20.2	3.18	2200	-463.2	-651.70	-188.50	27.8
80	2.05	2510	-203.51	-424.842	-221.33	8.9	2.67	2200	-546.31	-734.84	-188.53	16.6
Z-value = 14.11							Z-value = 19.46					

Table-1: Half-life and activation parameters for the first and second phase (k_1&k_2) respectively in thermal inactivation of peroxidase

K_1							K_2					
Tem (0C)	$t_{1/2}$ (min)	Ea (KJ/mol)	ΔG,	ΔH,	ΔS	D	$t_{1/2}$ (min)	Ea (KJ/mol)	ΔG,	ΔH,	ΔS	D
50	3.43	2160	-340.12	-525.42	-221.30	35.4	3.94	1270	-1230.61	-1415.42	-184.81	59.1
60	2.62	2160	-387.23	-608.56	-221.33	15.9	3.59	1270	-1313.72	-1498.56	-184.84	41.39
70	2.28	2160	-470.34	-691.70	-221.36	11.2	3.51	1270	-1396.83	-1581.70	-184.87	38.4
80	1.90	2160	-552.95	-774.84	-221.39	7.7	3.01	1270	-1479.94	-1664.84	-184.90	23.3
Z-value = 8.78							Z-value = 11.09					

Table-2: Half-life and activation parameters for the first and second phase (k_1& k_2) respectively in thermal inactivation of polyphinol oxidase

	K_1						K_2					
	Tem (0C)	$t_{1/2}$ (min)	Ea (KJ/mol)	ΔG,	ΔH,	ΔS	D	$t_{1/2}$ (min)	Ea (KJ/mol)	ΔG,	ΔH,	ΔS	D
50	4.05	2750	279.01	+64.58	-214.43	27.8	4.05	2160	-339.48	-525.42	-1859.4	65.8
60	2.49	2750	195.77	-18.56	-214.33	14.0	3.07	2160	-422.59	-608.56	-185.97	24.8
70	1.67	2750	112.65	-101.70	-214.35	6.1	2.97	2160	-505.57	-651.70	-186.00	21.5
80	1.34	2750	29.54	-184.84	-214.38	4.4	2.44	2160	-588.82	-774.84	-186.02	13.2
	Z-value = 7.81						Z-value = 16.11					

Table-3: Half-life and activation parameters for the first and second phase (k_1& k_2) respectively in thermal inactivation of lipoxygenase Experimental data collected at 50 ^{0}C. The values are given as SD from triplicates. Ea is the activation energy of inactivation process. It is obtained by plotting log k_1, the first order inactivation constent, against reciprocal of tempreture as per the Arrhenius equation k_1 is obtained from the slopes of plots of log k_2 residual activity against time ten hours. The engymes in assay

buffer were in incuvated at various temperatures. At regular intervals aliquots were removed to measure the residual activity expressed relative to that of the unhited control.

6. CONCLUSIONS - A foundation of fourth law of the fourth law of thermodynamics and dull vitality is proposed. Such a law exhibits a clarification of the extension of the universe by the negative weight created by the force connected with time as a mechanical variable. The important observation from these thermo inactivation experiments (Tables1,2and 3), is that at higher temperatures, response to temperature would appear to follow a biphasic denaturation pattern suggesting that inactivation occurs by more than one mechanism each with its own temperature dependence.

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