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Journal Name:	Physical Science International Journal
Manuscript Number:	Ms_PSIJ_29954
Title of the Manuscript:	Free energy estimation of a binary alloy around the equilibrium based on the order parameter
Type of the Article	Original Research Article

General guideline for Peer Review process:

This journal's peer review policy states that **NO** manuscript should be rejected only on the basis of '**lack of Novelty'**, provided the manuscript is scientifically robust and technically sound.

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PART 1: Review Comments

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
Compulsory REVISION comments		
Minor REVISION comments	Introduction When we read "atoms of type A and NB atoms of type B [1]. (figure 1)", we must read "atoms of type A and NB atoms of type B [1] (figure 1).". When we have card Ω , it is important to mention that "card Ω " represent the "number of elements of the set". For other hand card Ω is not the same of Ω , because Ω is "space of the possible positions" and card Ω is "the number of permitted configurations". The equality card $\Omega=\Omega$ is wrong. After present the equation 1.1 it is necessary to mention that S represents the entropy. b) Free Energy formula It is important mention that in the formula F=U-TS, that U is the internal energy of the system and T the absolute temperature of the surroundings. When we read "With In the regular case, the entropy always", we word "With" must start with lowercase letter. When we read "The probability lows of atoms", we must read "The probability laws of atoms". In the equation 1.3 it is important to identify the meaning of the P letter (probability). 2a) Free Energy formula based When we read "For the physicists, it is interesting to study the variation of this energy. Because, the equilibrium", we must read "For the physicists, it is	

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interesting to study the variation of this energy, because	
the equilibrium".	
When we consider the simplification of equation 2.2,	
why, in such simplification, the author or authors n	
consider that the term $-K_B I \frac{1}{1-n^2}$ is zero? Why the term	
$\frac{1}{-n}$	
$K_b T ln(\frac{2}{1+n})$ is zero? Why the term $K_b T n \frac{1}{(\frac{1}{1-n})(\frac{1}{1+n})}$ is	
2 ··· (2 ··/(2 ···)	
3.1 Aproximation	
Please denote also, in the condition following the	
equation 3.2 that $k \in N$.	
b) Justification order choice	
When we read "therefor the minimum in", we must	
read "therefore the minimum in".	
Please correct the expression	
$\lim_{n_n \to n_0} E_4(n_n) + P(n_n) \text{ for } \lim_{n_n \to n_n} [E_4(n_n) + P(n_n)].$	
The two terms are between parentheses.	
If P is a function of η , a single variable, what the	
author or authors want to say with "Thus, the unique	
critical point of P is (0; 0)."? What is the vector (0;0)?	
Means that P is zero when η is zero? If is that, please	
say it clearly.	
When we read "therefor P is strictly convex", we must	
read "therefore P is strictly convex".	
c) Study for the 4-th order case	
When we read "Let un put," what that meant? Is "Let	
me put"?	
On the equation 3.21 from where comes the term $\frac{-F_1}{2F_2}$?	

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	Or the term $\frac{-F_{1}^{2}}{4F_{2}}$? What is the vector (0, F ₀)? An equilibrium point in the space E, F? E is only function of η . Please precise mathematically the sentence. Remark 3.1 When we read "signs, nay their values", we must read "signs, not their values". References The references need a revision in order to have all important elements: Author family name, date, title, Editor and place of edition.	
Optional/General comments	Seems to me, to be important to clarify the mathematical steps of the expressions and the assumptions such as where the Taylor series is centred or the choices of the values of Tc. Seems to me also important to make a small description, elucidating about the big differences, of the figures 2 to 12.	

Reviewer Details:

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