THESIS TEMPLATE

I. PREVIOUS WORK

A. Atomic Parameters

In [1] , has used the ionic radii to calculate the electronic polarizabilities of transition metal oxides. Further it was shown that the polarizabilities of both the caions and the anions affect the dielectric and physical behaviour of tranisition metal oxides. In [2] , single oscillator based Sellmeier equation was used to derive the mean total polarizabilities for different oxides, hydroxides , oxyfluorides and others. An empirical equation was made using the free cation , free anion polarizability and the anion molar volume, neglecting the cation coordination number . Suitable refinements were done based on the fitting of the expiremental data. In the work of [3] , an attempt has been made to find a correlation between the free ion polrizabilities and the a physical property of oxides. A relation was observed between the energies of the outer valence elctrons and the cation polarizability. This relation is helpful in estimating the affect of the physical factors on the polarizing power of different species in a compound. In Ref VesselinD , a relationship have been formed between the free ion polarizability of metals /non metals and their respective outermost binding energy . It is stated that the polarization ability of the oxide ions in oxides are affected by other factors including the surrounding cation polarizability. In order to determine the cation polarizability , a similarity have been established between the ionization energy and the binding energy of outermost electrons based on their physical significance, the latter of which have been used further evaluate the free oxide polarizability. A correlaton was found between the cation polarizability and the binding energy of outermost electron , which is an easily accessible physical property , which can be determined experimentally. Further it was observed that the the oxide ion polarizability is largely influenced by the cation polarizability. This information is useful for studying the valence band interaction of oxide ions in different crystalline materials.In [4] , the author further discusses an Interaction Parameter for oxides based on the polarizability of oxide ion, dtermined from the refractive index. This Parameter is used as a measure of the interionic interaction between cations and anions created due to the charge overlap of the outermost electronic orbitals.The charge overlap and the polarizability of cation and anions both affect the Interaction Parameter. This Parameter serves as an index to estimate the optical properties of oxide glasses.

B. Microwave Theory

The works of [5], explains the theoritical steps to be taken to calculate the reflection Loss using Transmission Line Theory. It states the different characteristic Electrical parameters of Transmission Lines and how to appropriately use them , in conjunction with microwave absorbing materials. Two key points are highlighted , one is of the characteristic Impedance which is to be considered as an instrinsic property of the material , independent of sample thicknessand the calculation of the reflection Loss with respect to the free space. There is a similar attempt in [6] for ferrite based microwave absorbers to model the theoritical perspectives for both resonance and non resonance based absorbers. In this model a relationship is established to relate the electric and magnetic structures of the absorber material. The resonance oscillations are modelelled as resistance and the non resonance oscillation of electric and magnetic dipoles are modelled as inductive and capacitive elements. A detailed absorption model is then provided to include all the above elements in the basics of reflection and absorption formulas of transmission line theory.

C. POLARIZABILITY

Analyising polarizability gives an insight into the wave absorbing power of a material. Following this , in [7] , the Lorentz-Lorenz equation was used to estimate the electronic polarizability of ions in oxide glasses , based on their refractive indices and band gap energy. In the [8] , the spatial energy parameter was used was used for the evaluation of activation energy of diffusion and self diffusion process. The methodology used here can be applied to different physical and chemical processes involving the atomic energies viz potential, kinetic and other volume energies. The spatial energy Parameter which is equivalent to the avergaed enegy characteristics of valence orbital is calculated by adding the inverse of the atomic orbital energy accounting the screening charges and the ionization energy . When normalized with atomic radii , the effective P-Parameter is introduced wich can be used for comparative estimation between two atoms while forming a new structure. The less is the difference the more favuorable is the new structure.

D. MAGNETIC MICROWAVE ABSORBER

In [9] different magnetic materials were explored that can possess single phase permittivity and permeability to give required microwave absorption. These materials called as smart magnetic materials are inorganic crystalline materials with new compositions of different magnetic materials and rare earth metals where the lattice interpenetrates with the incident electric

and magnetic fields by virtue of their permittivity and permeability. In ErRuSi experimental and theoritical studies of magnetic properties of ErRuSi were done. In [10] materials facbricated by the iron ingredients were reviewed for Electromagnetic Interference Shielding applications. The author choses Fe and Fe alloys including ferrites due to their desirable properties like high permeability, low conductivity ,biocompatibility and biodegardability . Including magnetic materials in absorber add provide permeability to the structure which leads to additional magnetic losses along with the existing dielectric losses. The author further highlights the theoritical aspects that affects the magnetic loss . These are suscetibility (both spin and motion susceptibilities), size , shape and morphology,and the thickness of the microwave absorber.

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