Review Form3

Book Name:	Current Research Progress in Physical Science
Manuscript Number:	**Ms_BPR_4090**
Title of the Manuscript:	**EXPLORING THE CONFINEMENT REGIME IN SPHERICAL ZnO , CdS, and CdSe COLLOIDAL (STAND ALONE) QUANTUM DOTS**
Type of the Article	**Book chapter**

PART 1: Comments

	Reviewer's comment	**Author's Feedback***(Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimumof 3-4 sentences may be required for this part.	Thismanuscriptholdssignificantimportance for thescientificcommunity asitprovidesadetailed theoreticaland computational analysis of quantum confinement regimes in ZnO, CdS, and CdSe quantum dots. By elucidatingthe size-dependentopticaland electronicproperties, itoffers valuableinsights into thedesign and optimization of quantum dotsfor advanced optoelectronicapplicationssuch aslight-emitting diodesand transistors.Furthermore, the work establishes clear distinctions between weak, intermediate, and strong confinement regimes, serving as a crucial reference for both researchers and engineers working on nanomaterials. Its findings contribute to the broaderunderstandingofmaterial-dependentquantumbehaviors,pavingthewayforinnovationsin nanotechnologyandsemiconductor-baseddevices.	
Is the title of the article suitable? **(If not please suggest an alternative title)**	Thetitle,"ExploringtheConfinementRegimeinSphericalZnO,CdS,andCdSeColloidal(StandAlone) Quantum Dots," is informative but could be refined for better clarity and appeal. SuggestedRevisions: "UnderstandingQuantumConfinementRegimesinZnO,CdS,andCdSeColloidalQuantumDots" "TheoreticalInsightsintoConfinementRegimesofZnO,CdS,andCdSeColloidalQuantumDots" "ExploringSize-DependentConfinementEffectsinZnO,CdS,andCdSeQuantumDots"	
Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here.	Theabstractiscomprehensivebutcouldbenefitfromafewadjustmentstoenhanceclarityandimpact.Itprovides a good overview of the focus (quantum confinement effects), materials studied (ZnO, CdS, CdSe), and potential applications (field-effect transistors and optoelectronics). However, the following suggestions can improve it further: SuggestionsforImprovement: 1. **Include Specific Results:** Add key findings, such as numerical ranges for confinement regimes or specific insights about the transitions between weak, intermediate, and strong confinement. 2. **HighlightNovelty:**Brieflymentionwhatdistinguishesthisstudyfrompreviouswork. 3. **Remove Redundancy:** Phrases like "Quantum confinement effects dictate optical and electronic behaviors" could be condensed to avoid repetition. **Add Methodology Details:** Mention that the study involves computational simulations and theoretical analysis to add depth.	
Is the manuscript scientifically, correct? Please write here.	The manuscript is scientifically sound and provides detailed explanations of quantum confinement phenomena. However: 1. **Mathematical Derivations:** The equations and theoretical models appear correct but should be cross-verified for consistent variable definitions. **ResultsValidity:**Thenumericalresults(e.g.,confinementrangesandenergies)alignwellwithestablished theoretical principles but could benefit from experimental comparisons for validation.	

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Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form. **-**	1. **Sufficiency:** The manuscript includes a strong foundation of references (both theoretical and applied),with citations spanning from foundational works to recent studies. 2. **Recency:**Whiletherearea fewrecentcitations (2020–2024),addingmorecontemporaryreferences, especially for ZnO, CdS, and CdSe applications, would enhance the manuscript's relevance. **Diversity:**Includeadditionalpapersfromleadingjournalsinnanotechnologyoroptoelectronicsto broaden the context.	

Is the language/English quality of the article suitable for scholarly communications?	1. **SuitabilityforScholarlyCommunication**:Thelanguageismostlyclearandtechnical,suitable for academic audiences. However: • **MinorGrammarIssues**:Instanceslike“Quantumdotshavegarneredsignificantattentiondue to its...” (should be “their”) need correction. • **SentenceStructure**:Somesentencesarelongandcouldbesimplifiedforbetterreadability. 2. **Suggestions**: • Proofreadtoaddressminorerrors(e.g.,“Quantumdotss”shouldbe“Quantumdots”). Useconsistentterminology(e.g.,“Bohrradius”vs.“excitonBohrradius”).	
Optional/Generalcomments	**General Comments** 1. **ClarityofObjectives**:Theobjectiveofexploringquantumconfinementregimesisclear, but the introduction could benefit from a sharper problem statement. 2. **ConsistencyinTerminology**:Termslike"confinementenergy,""Bohrradius,"and "quantumdots"areusedthroughout,butaglossaryorconsistentexplanationfornon- experts would help readability. 3. **Figures**:Figures1and2arehelpfulbutlackdescriptivecaptions.Includingcontextfor each figure will enhance their utility. 4. **Mathematical Representations**:Equationsarepresentedcorrectly,butsomevariables lackdetailedexplanation,suchasme∗m^*_eme∗ andεr\epsilon_rεr.Providingakeyor legend would improve understanding. 5. **References**:Citationsareadequate,butrecentworks(2020–2024)shouldbeexpanded for a more up-to-date perspective. 6. **Abstract**:Theabstracteffectivelysummarizestheworkbutcouldhighlightspecific numerical results or key findings for better impact. 7. **Conclusion**:Itisconcisebutcouldbetterdiscussthepracticalimplicationsoffindingsin device optimization. 8. **Language**:Minorgrammaticalissues,suchas"Quantumdotshavegarneredsignificant attention due to its..." (should be "their"). 9. **FiguresandGraphs**:Addingdiagramsforexperimentalsetuporcomputational modeling would improve comprehension. 10. **LiteratureContext**:Theintroductiondiscussesthestateoftheartbutcouldelaborateon how this work builds on or diverges from prior studies. DetailedSectionComments **Introduction** 11. **BackgroundContext**:DiscussapplicationsofZnO,CdS,andCdSeinmoredetail, beyond general optoelectronics, e.g., specific device examples. 12. **TerminologyIntroduction**:Theterm"quantumdots"iswell-introduced,but"quantum confinement regimes" needs more context upfront.	

Review Form3

	13. **Motivation**:Thepracticalmotivationforstudyingtheseconfinementregimescouldbe better emphasized. 14. **Structure**:Mentioningthestructureofthepaper(e.g.,"Thispaperisorganizedas follows...") would improve navigation. Methods 15. **ComputationalDetails**:Thecomputationalapproachisnotwell-detailed.Specify software, computational methods, and assumptions. 16. **EquationDerivation**:Equation(1)iscriticalbutlacksanexplanationofitsphysical meaning. 17. **ParametersUsed**:Thematerialparameterslistedarethoroughbutwouldbenefitfroma tabular presentation for easier reading. 18. **ExperimentalTechniques**:Whilecolloidalsynthesisismentioned,noexperimental validation or replication methodology is described. Results 19. **DataPresentation**:Theresultsarecomprehensivebutdense.Summarizingrangesof confinement regimes in a table would improve clarity. 20. **Graphs**:Addingplotstovisualizeconfinementenergyvs.sizewouldsignificantly enhance understanding. 21. **QuantitativeDiscussion**:ResultsforZnO,CdS,andCdSearementioned,buttheir physical implications need more discussion. 22. **Comparisons**:Comparisonswithpreviousliteratureareminimal.Highlightsimilarities or differences explicitly. Discussion 23. **PhysicalInterpretation**:Discusswhycertainmaterialsexhibitstrongerconfinement than others in more detail. 24. **Applications**:Connectfindingsexplicitlytoapplicationsliketransistorsor lasers. 25. **WeakPoints**:Addresspotentiallimitations,suchasthevalidityofassumptionsin theoretical models. 26. **FutureWork**:Suggestmorespecificdirectionsforfurtherresearch,suchastestingwith other semiconductors. Conclusion 27. **ImpactStatement**:Elaborateonhowunderstandingconfinementregimesadvances quantum dot technology.	

	28. **Generalization**:Discusswhetherfindingsareapplicabletoothertypesofquantum dots. FiguresandCaptions 29. **Figure1**:Add acaption thatexplainsthesignificanceofthesize-sortedquantum dots. 30. **Figure2**:Captionshouldexplainwhatenergylevelsrepresentandwhysizeaffectsthem. StylisticComments 31. **SentenceStructure**:Somesentencesaretoolong,makingthemdifficulttofollow.Break them up for clarity. 32. **Grammar**:Fixminorgrammaticalerrorsthroughoutthemanuscript. 33. **Formatting**:Equationsshouldhaveconsistentformatting,withclearnumberingand references in the text. SpecificCommentsonEquations 34. **Equation(1)**:ClarifywhetherRRRisradiusordiameterforconsistency. 35. **Equation(10)**:ExplainthephysicalmeaningoftheequivalencebetweenBohrradius and de Broglie wavelength. 36. **Equation(12)**:Definetheconstantusedintheequation explicitly. ReferenceComments 37. **KeySources**:Addrecentreviewsonquantumdotsfrom2020onwards. 38. **CitationStyle**:Ensureconsistencyincitationformatting(e.g.,authorinitialsplacement). 39. **SpecificGaps**:Missingcitationsforpracticalapplicationsofquantumdotsintransistors. FormattingComments 1. **SectionTitles**:Standardizecapitalization(e.g.,"Results"vs."ResultsandDiscussions"). 2. **TextAlignment**:Ensureconsistentalignmentoftext,especiallyequationsandlists. 3. **Tables**:Addingatablesummarizingconfinementparametersforallmaterialswould enhance readability. 4. **BulletPoints**:Usebulletsornumberedlistsinsectionslike"DeterminantsofQuantum Confinement." RecommendationsforImprovement 5. **IncludeExperimentalValidation**:Ifpossible,complementsimulationswith experimental data.	

Review Form3

	6. **Simplify**:Removeoverlytechnicaljargonwherepossible,orinclude definitions. 7. **SupplementaryMaterial**:Addsupplementarydata,suchasadditionalplotsor computational details, in appendices. MinorErrors 8. **TypographicalErrors**:Correctminortypos,e.g.,“Quantumdotss”to“Quantumdots.” 9. **FormattingErrors**:Ensureconsistentfontsizes andstyles,especiallyinequations. 10. **References**:VerifyURLcitationsforaccuracyandupdatethemwherenecessary. General Questions 1. **QuantumConfinement**:HowdoestheexcitonBohrradiusinfluencethetransition between weak, intermediate, and strong confinement regimes? 2. **MaterialDependency**:WhydodifferentmaterialslikeZnO,CdS,andCdSeexhibit varying ranges of confinement regimes? 3. **Applications**:Howcanthefindingsonquantumconfinementregimesbedirectlyapplied to improve the performance of optoelectronic devices? Introduction 1. **QuantumDots**:Whataretheprimarydifferencesbetweenbulksemiconductorsand quantum dots in terms of electronic and optical properties? 2. **FabricationMethods**:Howdoesthechoiceoffabricationmethod(e.g.,colloidal synthesis vs. epitaxy) impact the properties of quantum dots? Methods 3. **Equations**:HowdotheassumptionsbehindEquation(1)influencetheaccuracyof confinement energy calculations? 4. **DeBroglieWavelength**:WhyisthedeBrogliewavelengthequivalenttotheexciton Bohr radius in quantum confinement theory? 5. **ComputationalApproach**:Whatnumericaltechniquescouldbeusedtorefinethe theoretical analysis of confinement regimes? Results 6. **SizeRanges**:HowdothecalculatedrangesforquantumconfinementregimesinZnO, CdS, and CdSe compare with experimental observations? 7. **EnergyGaps**:Whataretheimplicationsofconfinement-inducedchangesinenergygaps for the practical design of quantum dot-based devices?	

	8. **MaterialParameters**:Howsensitivearetheconfinementenergycalculationstothe dielectric constant and effective mass values used? Discussion 9. **PhysicalInterpretation**:Whatphysicalfactorscontributetothestrongerconfinement effects in ZnO compared to CdSe? 10. **PracticalUse**:Howdotheresultsguidetheoptimizationofquantumdotsizeforspecific applications like transistors or LEDs? 11. **TransitionPoints**:Whyarethetransitionsbetweenconfinementregimescriticalfor practical device applications? Figuresand Data 12. **Graphs**:Howcouldadditionalgraphs,suchasconfinementenergyvs.size,helpvalidate the theoretical findings? 13. **Visualization**:WhatinsightscanbedrawnfromFigure1aboutsize-dependentoptical properties of quantum dots? AdvancedTopics 1. **QuantumMechanics**:Howdoestheconceptofwavefunctionconfinementrelatetothe discrete energy levels in quantum dots? 2. **Heterostructures**:Howwouldheterostructurequantumdots(e.g.,core-shelldesigns) modify the confinement regimes described? 3. **TemperatureEffects**:Howmighttemperaturevariationsaffecttheconfinementregimes and calculated parameters? FutureWork 4. **MaterialExploration**:Howmighttheconfinementregimesdifferforother semiconductors like silicon or gallium arsenide? 5. **ExperimentalValidation**:Whatexperimentaltechniqueswouldbemosteffectivein verifying the theoretical findings presented? 6. **Multi-ExcitonSystems**:Howdomulti-excitoneffectsinfluencetheconfinementenergy in quantum dots?	

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PART 2:

	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)***
Are there ethical issues in this manuscript?	***(If yes, Kindly please write down the ethical issues here in details)***	

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