Dear Editor and Reviewers,

We want to thank you all for the prompt review of our manuscript entitled "Quantum Light Source Based On Semiconductor Quantum Dots: A Review" (Manuscript ID: photonics-2359722).

We gratefully thank the reviewers for their useful remarks and constructive suggestions, which are valuable to improve the quality of our manuscript. We have revised the manuscript based on the reviewers' comments. The changes and additions are marked in red in the revised manuscript. The reviewer's comments are listed below, along with our responses.

Reviewer #1:

Comment #1: In Section 2.3 and Figure 3a, the authors have roughly calculated the emission efficiency for the QDs. The authors assumed the interface of GaAs and air, which is not accurate, as it is far from the real structures with capping barriers or DBR structures.

Reply #1: The calculation is for the case where the semiconductor quantum dots are not coupled inside a microcavity. The purpose is to show that the single photon source efficiency is very low in the absence of microcavities (like microcolumn cavities, Circular Bragg grating (CBG) cavities and photonic crystal microcavities), thus illustrating the importance of microcavities in improving the single photon efficiency of semiconductor quantum dots. We clarify this point at the end of page 4 in Section 2.3.

Comment #2: In Eq. 5, please further explain what are Ec and Ex, where are the energies taken in the E-k map?

Reply #2: Ec in Eq. 5 usually denotes the energy of the microcavity optical field mode (usually fundamental mode) and Ex denotes the uncoupled quantum dot exciton energy level, which are the energies of the E-k diagram. Zero detuning (i.e., resonance) can usually be achieved by adjusting the temperature of the quantum dot environment so that Ex is equal to Ec.

Comment #3: The Eq.6 is not taken the mode detuning effect into account. In the case that emission spectra from quantum dots are very narrow, it may have possibilities of deviation to the cavity modes, which is a critical factor that will reduce the Fp.

Reply #3: As in the current classical related review papers in this field (Refs. [1] and [2]), etc., for the sake of brevity of the review, we didn't consider here the case at detuning. Here, we included this part:"In fact, Fp will be far from the optimal value because of the existence of detuning between quantum dots and microcavities and other problems. When $Fp < 1$, the spontaneous radiation rate of quantum dots will be suppressed; when $Fp > 1$, the spontaneous radiation rate of quantum dots will be

enhanced, which means more single photons will be radiated by quantum dots per unit time." at the end of page 5.

Comment #4: The reviewer would suggest that the author to discuss on the strategies of electrically pumped single photon emitters and existing challenges.
Reply #4: Following the reviewer's suggestion, We have added "There are still huge challenges regarding electrically pumped single-photon sources based on semiconductor quantum dots, such as complicated fabrication processes, low collection efficiency, and how to effectively overcome the effects of charge noise, etc." in page10 of the manuscript.

Reviewer #2:

Comment #1: The cavity-enabled enhanced efficiency is not very clear. The authors should describe the part with a proper schematic.
Reply #1: Figure 3(b) shows the typical single-photon source consisting of a single QD coupled coherently, with coupling constant g, to one mode of an Fabry-Pérot cavity. Incoherent processes are spontaneous emission from the nonclassical light emitter to the continuum at rate γ , and photon loss through the cavity mirrors at rate κ. Integrating quantum dots into optical microcavities can channel the spontaneously emitted photons into a well-defined spatial mode and in a desired direction to improve the overall efficiency, and can alter the spectral width of the emission. It can also provide an environment where dissipative mechanisms are overcome so that a pure quantum-state emission takes place. We rephrase this part in the middle of Page 5.

Comment #2: The review is limited to III-V semiconductors (InAs/GaAs), would suggest including others for generality.
Reply #2: Following the reviewer's suggestion, In section 3.1 of the overview, we added "It should be noted that the semiconductor quantum dot growth method given here is not limited to InAs/GaAs QDs, but is also applicable to QDs of other semiconductor materials."and In section 3.2 of the overview, we added "It should be noted that the analysis of the band structure of semiconductor QDs given here is not limited to InAs/GaAs QDs, but is also applicable to QDs of other semiconductor materials."

Comment #3: English needs to be improved and multiple sentences are joined together making it harder to comprehend. I would suggest consulting with some English experts.
Reply #3: We have checked the English writing thoroughly and made the necessory change to improve the writing.

A few are mentioned below.

(A) Page2 : Among them, semiconductor quantum dots are discrete energy levels in which carriers are bound by spatially in three dimensions to form atom-like structures, which can produce single photons with narrow spectral lines and high luminance at low temperatures, and are also highly compatible with modern semiconductor fabrication processes, enabling large-scale integration and expansion of quantum-emitting devices on semiconductor chips.

(B) Page 2: Taking photons as the carriers of quantum information, this paper firstly introduces the nature and generation principle of single-photon sources, then presents the implementation and development of single-photon sources in self-assembled semiconductor QD, and finally summarizes the progress in the field of single-photon sources and entangled photon sources in optical microcavity-enhanced semiconductor QD in recent years, and summarizes and outlooks the future development of QD quantum light sources.

(C) Page 3: The photons emitted from a coherent light source represented by a laser satisfy the Poisson distribution, and the probability of detecting two photons at the same time is the same, and there is neither a fixed time interval nor any correlation between the two photons; the photons emitted from a single photon source represented by a single quantum dot light show antibunching effect, which satisfies the sub-Poisson distribution, and the probability of detecting two pho-tons at the same time is the same at the zero moment (t=0s), and there is a fixed time interval between the photons emitted one after another. There is a fixed time interval be-tween the photons.
There are plenty of similar kinds of sentences in the present draft.

Reply #3:
Thanks to reviewers carefully readings. We revised these sentences as follows. All the other similar sentences are revised accordingly in the manuscript.
(A) Among them, the semiconductor QDs are a kind of quasi-zero-dimensional nanometer material and have excellent photonic properties, which can be used to generate single photons and entangled photon pairs. Furthermore, the linewidth of their emitted photons is ability to be radiative lifetime limited and it is highly compatible with modern semiconductor manufacturing processes, enabling large-scale integration and scaling of quantum emitters on semiconductor chips.
(B) In this work, we take single photon as the carrier of quantum information, we firstly introduce the performances and principles of single-photon sources. Then, we introduce the realization and development of of single photon sources and entangled photon sources based on semiconductor QDs, especially for semiconductor QD single photon sources and entangled photon sources with artificial microstructure enhanced emission. Finally, we summarize and prospects the future development of quantum light sources based on semiconductor quantum dots.
(C) The coherent light source represented by the laser which emits photons with randomization, satisfies the Poissonian distribution, shows that the probability of detecting two photons at the same time is the same and there is neither a fixed time

interval nor any correlation between the two photons. While the quantum light source represented by the single photon source which emits photons showing antibunching, satisfies the Sub Poissonian distribution and exhibits no simultaneous detection of two photons at the zero moment (t = 0) and a fixed time interval between the successive emitted photons.

Comment #4: Lots of typos

(A) Glover search algorithm[7], etc., quantum communication
(C) photon source.a very important
(D) experiment.g2(τ) indicates the
(E) which has a spin (S_z =1/2 and a spin S_z=±1/2) in the z-axis direction
The author should take care of this type of mistake seriously.

Reply #4:
Thanks to reviewers carefully readings. We corrected these typos and all the other typos accordingly in the manuscript.
(A) Grover's search algorithm[7], etc., quantum communication
(C)photon source is a very important
(D)experiment. $g^{(2)}(\tau)$ indicates the
(E)which has a spin of S_z=1/2 and a spin of J_z=±1/2 in the z-axis direction.

Comment #5: The future prospect is largely missing in the review and presented in a scattered way.
Reply #5: Following the reviewer's suggestion, We included "At the beginning, single photon sources based semiconductor QDs are thought to be not ideal, due to their uncontrollability of QD positioning, low device yield, cryogenic working condition, as well as difficult to achieve electric pumping. However, after the recently tremendous development as discussed above, semiconductor QDs are moving toward the promising quantum light sources suitable for various applications in the field of quantum information. We have reasons to believe that single photon sources based on semiconductor QDs are becoming one of the most attractive candidates as the next generation of ideal quantum light sources." in the conclusions part of the manuscript.

Reviewer #3:

Comment #1: Authors systematically use "emitted fluorescence" and similar combinations in the text. Fluorescence is a process of emission and cannot be emitted by itself.
Reply #1: We agree with the reviewer's viewpoint. We have modified the sentences with "emitted fluorescence" in the original manuscript as: The size of the dots has a great influence on the spectral lines of QD fluorescence, and the larger the difference

in the size of QDs, the larger the difference in the fluorescence emission wavelength of QDs. Please check the modified manuscript for details.

Comment #2: Authors name optical transitions as “jumps” and “leaps”, which is also a bit controversial to the majority of scientific works in the field.
Reply #2: We agree with the reviewer's viewpoint.We have changed "jumps" and "leaps" to "transitions", please check the revised manuscript.
Comment #3: Similarly, they use “cleaving” for the spectral line splitting and “single photonicity”, which I’ve personally never met before.
Reply #3: We agree with the reviewer's viewpoint. We changed the original sentence to “HBT inteferometer to detect the second-order correlation coefficient $g^{(2)}(0)$.”
Comment #4: I’ve tried to highlight other problems in the manuscript (please see attached pdf), because it’s hard to describe here all of them. Regarding scientific part of the work, I suggest authors also add into the review works about nanophotonic Mie-type resonators with embedded QDs (see for example, 10.1021/acs.nanolett.7b03248 and 10.3390/nano13030507). These structures also can effectively control QD light emission both in time and space.
Reply #4: Thanks to reviewers carefully readings. We modified the manuscript according to the reviewer’s comment. Please check the revised manuscript for details. Following the reviewer’s suggestion, We have added “However, it is difficult to fabricate both Bragg resonators with many periodic thin layers using epitaxial methods and photonic crystals with periodic array of holes using electron beam lithography (EBL). In addition, surface plasmons in metallic structures have their intrinsic drawbacks such as high optical losses which can quench spontaneous emission limiting their potential applications. The coupling of QDs to lossless all-dielectric photonic nanostructures based on high refractive index materials with optical response governed by multipolar Mie-type resonances has gained increasing popularity in recent years due to the simplicity in their fabrication. In 2017, Rutckaia V. et al. showed that Mie resonances govern the enhancement of the photoluminescent signal from embedded Ge(Si) QDs due to a good spatial overlap of the emitter position with the electric field of Mie modes. Based on the nanodisk mode engineering they also show that the mode hybridization in a nanodisk trimer results in an up to 10-fold enhancement of the luminescentsignal due to the excitation of resonant anti-symmetric magnetic and electric dipole modes[66]. In 2023, Kroychuk M K. et al. experimentally and numerically investigated the excitation of magnetic Mie-type resonance by linearly polarized light in a GaAs nanopillar oligomer with embedded InAs QD leads to quantum emitters absorption efficiency enhancement[67]. Moreover, they experimentally demonstrated more than ten times QDs PL enhancement and numerically reached forty times gain compared to unstructured film when the excitation wavelength is in the spectral vicinity of Mie-type resonance. We believe that QDs coupling with Mie-type resonant oligomers collective modes for nanoscale single-photon sources can be a promising candidate for next-generation quantum light sources for quantum information.” in the manuscript.

In addition, we redraw Figure 3(b), Figure 6(a) and Figure 9(a). Please see our revised manuscript for details of other revisions to the manuscript.

Thank you for your consideration of our revised manuscript.

Best Regards,

Rusong, Fengqi Liu and Quanyong Lu