Response to Reviewer 1

The authors summarized the progress in the research of inducing ferromagnetism in 2D ReS_2. The covered topics include defect introduction, chemical substitution, strain, structural modification by the incorporation of another phase, and the use of twin boundaries, about which they seem to be rather skeptical.
They showed that theoretical calculations have been a good guideline for experimental efforts in this field.
The number of citations are good enough and they seem to have cited the works of different groups fairly. This review can be a compact introduction to the research of magnetism not only in ReS_2, but other 2D materials.
I have no particularly major concern on this paper. I just have some minor comments.

[Comment]:
Point1. Since this is a review paper and the readership is not limited to the researchers of ReS_2, it will be better to explain in the Introduction why ReS_2 is particularly important among other TM dichalcogenides.

[Response]:
Thank you very much for taking time to review our manuscript and for the positive comments on our manuscript. In response to your point 1, we have added the following sentences on page 1-4 in the revised manuscript.

"Unlike other hexagonal (*H* or 2*H*) transition metal chalcogenides (TMDs) with high symmetry, the unique distorted (T_d) structure of rhenium disulfide (ReS_2) has a low in-plane symmetry [41], which endows it with strong in-plane anisotropic properties [42-44]. It is worth noting that a series of progress has also been made in the RTFM of ReS_2." on page 1-2.

"As shown in Figure 3(A), the crystal structure of ReS_2 with T_d phase [41] is obviously different from that of MoS_2 with *H* phase [49, 50]. Density functional theory (DFT) calculations show that bulk (1.35 eV) and monolayer (1.43 eV) ReS_2 have similar band structures, both of which are direct band gap semiconductors, but their band gaps are slightly different (only 80 mV difference) in Figure 3(B).

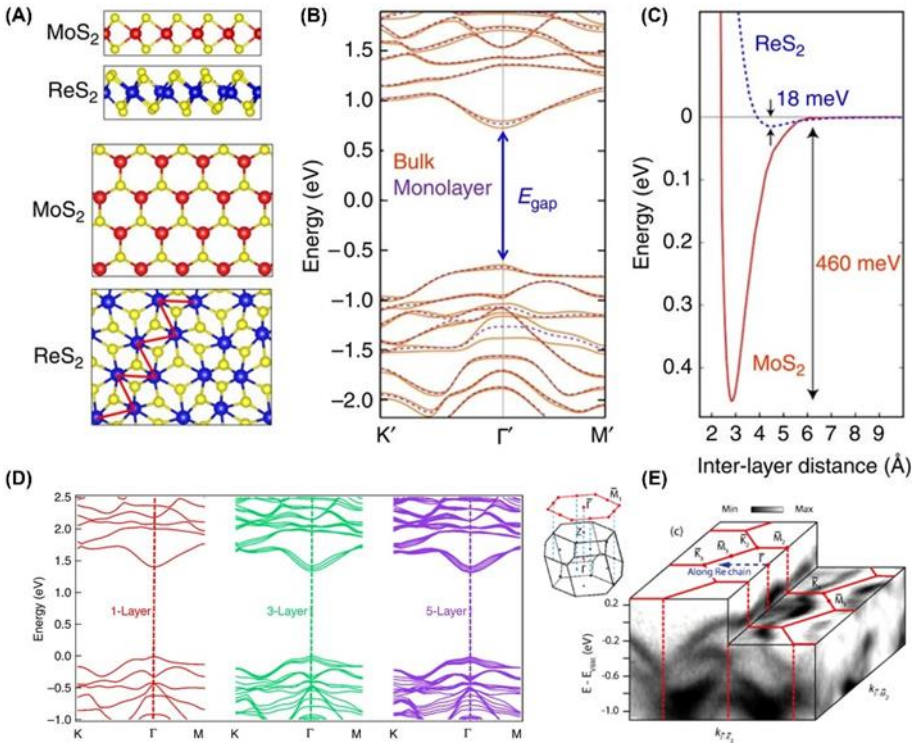


Figure 3. (A) Top and side view of single-layer crystal structures of side (top two panels) and top view (bottom two panels) of ReS_2 with T_d crystal structure compared with the 1*H* structure of conventional monolayer TMDs. The Re atoms dimerize as a result of the Peierls distortion forming a Re chain denoted by the red zigzag line. (B) DFT calculated electronic band structure of bulk and monolayer ReS_2. Both are predicted to be a direct bandgap semiconductor with nearly identical bandgap value at the Γ point. (C) The calculated total energy of the system as a function of interlayer separation. The significantly shallower depth of the well in ReS_2 implies much weaker interlayer coupling energy in ReS_2 as compared with MoS_2. (Reprinted figure (A-C) with permission from [41]. Copyright (2018) by Springer Nature). (D) DFT calculated electronic band structure of monolayer, trilayer and five-layer ReS_2 by ab initio calculations indicating band gaps of 1.44, 1.40 and 1.35 eV, respectively. (Reproduced with permission from [51]. Copyright (2018) by Springer Nature). (E) Overview of the valence-band structure as measured by ARPES, showing strong in-plane anisotropy. The surface Brillouin zone is shown as red lines, and the momentum space direction corresponding to the real-space direction along the Re chains is also indicated. The bulk and projected surface Brillouin zones are shown in the inset. (Reprinted figure with permission from [52] Copyright (2014) by the American Physical Society).

Actually, the adjacent layers in ReS_2 are only weakly coupled (~18 meV) in Figure 3(C), while those in MoS_2 are coupled with much higher energy (~460 meV). Interestingly, when the thickness of ReS_2 is reduced down to a single layer [51], its electronic band structure does not exhibit a transition from an indirect to a direct bandgap, which is different from that of MoS_2." on page 3-4.

[Comment]:

Point 2: In line 14 on page 3, it goes "The mechanism defect of the modulated magnetism was then revealed." Is there an error in this sentence possibly?

[Response]:
As the reviewer pointed out, we have revised the relevant sentences on page 4.

“The mechanism of defect-mediated magnetism was then revealed.”

[Comment]:
Point 3: In the caption of Fig. 3, (h) should be capitalized and bold.

[Response]:
Thank you very much for your comment. According to your suggestion, we have revised the caption of Fig. 4(H) on page 4.

[Comment]:
Point 4: In the second paragraph of page 4, the words "web buckle" appears. Since this term was new to me, I took a look at the Ref. 27, but here again this word was used without definition. I also looked up "web buckle" at Google Scholar, but all the usages other than by the authors' group were related to architecture, meaning buckling in the web part of some beam structure. I can imagine the implication of these words, but not for sure. I really appreciate if the authors give a definition here.

[Response]:
We thank the reviewer for this valuable suggestion. According to your suggestion, we have added the two references related to web buckles as Refs. 68 and 69, and added given a definition on page 5 of the revised manuscript.

“Buckles exist in multiple directions in the plane, and cross each other to form some web patterns.”

[Comment]:
Point 5: In the caption of Fig. 5, Date should read Data.

[Response]:
Thank you very much for your comment. According to your suggestion, we have revised the caption of Fig.6 on page 6 of the revised manuscript.

[Comment]:
Point 6: In line #4 from the bottom on page 5, the use of "the weakest" seems inappropriate to me since there were elements with no effect. "modest" will be a better choice.

[Response]:
Thank you very much for your comment. According to your suggestion, we have substituted “modest” for “weakest” on page 6.

[Comment]:
Point 7: In line 1 on page 7, A RTFM should read An RTFM.

[Response]:
Thank you very much for your comment. According to your suggestion, we have modified the sentence on page 8 of the revised manuscript.

[Comment]:
Point 8: In line 6 on page 7, a word "desired" or something similar may well be added before "properties".

[Response]:
Thank you very much for your helpful suggestion. Following your suggestion, we have added the word “desired” before “properties” sentence on page 8.

[Comment]:
Point 9: In line #9 from the bottom on page 8, the hyphen after "temperature" should be omitted.

[Response]:
Thank you very much for your helpful suggestion. Following your suggestion, we have removed the hyphen on page 9.

[Comment]:
Point 10: In line #3 from the bottom on page 8, "magnetic" should read "non-magnetic"?

[Response]:
Thank you very much for pointing out this mistake. Following your suggestion, we have revised the sentence on page 9 in our manuscript.

[Comment]:
Point 11: In the first paragraph of page 9, it would be kinder to readers to comment that a negative strain value in Fig. 11 (G)-(I) means compressive strain and a positive one tensile.

[Response]:
Thank you very much for your helpful suggestion. Following your suggestion, we have revised the sentence in the first paragraph of page 10, and added the relevant description in the caption of Fig. 12 on page 10.

“In fact, when the compressive strain decreased from -8% to -5% (V_{Re}), -5% (V_{ReS}) and -2% (V_{ReS2}), the system could maintain the maximum magnetic moment of 1 μ_B/supercell, 1 μ_B/supercell and 3 μ_B/supercell, respectively.”

“Please note that when the strain value is negative, the strain is compression strain; When the strain is positive, it is a tensile strain.”

[Comment]:
Point 12: In the caption of Fig. 11, eAngstrom^3 should be eAngstrom^-3.

[Response]:
Thank you very much for pointing out this mistake. Following your suggestion, we have revised the sentence in the caption on page 10.

[Comment]:
Point 13: In line 6 on page 10, "a second phase" is better to be "the second phase" since it has been mentioned in the previous paragraph.

[Response]:
Thank you very much for your helpful suggestion. Following your suggestion, we have revised the sentence on page 11.

[Comment]:
Point 14: In the caption of Fig. 12, unpolaize should be unpolarized and oliveone needs a blank space between olive and one.

[Response]:
Thank you very much for pointing out this mistake. We have corrected it in the caption of Fig. 13, and added a blank space between olive and one on page 11.