We thank the reviewers for their helpful comments. Our point-by-point response can be found below. The reviewers' comments are in *italics* and changes made to the manuscript are in blue. The line number mentioned corresponds to the tracked-change version. All the changes made do not affect the conclusions in the manuscript.

Reviewer #1

The study examined the concentration, size distribution, and seasonal variations of EPFRs in the North China Plain region, as well as investigated their sources using PMF. It also explored the role of EPFR speciation in contributing to the oxidative potential of PM. I find this study very interesting and important. The authors have done a great job to discuss other studies comprehensively. I only have two comments as follows:

Reply: We thank the reviewer for the positive review and helpful comments. We have addressed each comment below.

1. *The conclusion that the majority of EPFRs are present in $PM_{2.5}$ is drawn from the fact that the average EPFRv in $PM_{2.5}$ accounts for over 95.2% of those in PM10 and TSP. However, the box plots in Fig. 1 suggest that $PM_{2.5}$ EPFRs may not make up such a high fraction. I recommend that the authors calculate the fraction of EPFRs in $PM_{2.5}$ in PM_{10} or TSP for each sample and average it for discussion, for better representativeness.*

Reply: We thank the reviewer for the suggestion. As noted in Line 86 of the original manuscript (now Line 87 of the revised manuscript), 24-hr $PM_{2.5}$, PM_{10}, and TSP samples were collected sequentially. Thus, calculating the fraction of EPFRs in $PM_{2.5}$/PM10/TSP for each sample was unable to perform in this study. However, we have examined the fraction of EPFRs in $PM_{2.5}$/PM10/TSP for each season in the revised manuscript. The results indicate EPFRv in $PM_{2.5}$ were all greater than 89.5% of those in PM10 and TSP, further suggesting that the majority of EPFRs are present in $PM_{2.5}$.

Line 164: Similar results were found for EPFRv and PM concentrations in each season (Figure S5).

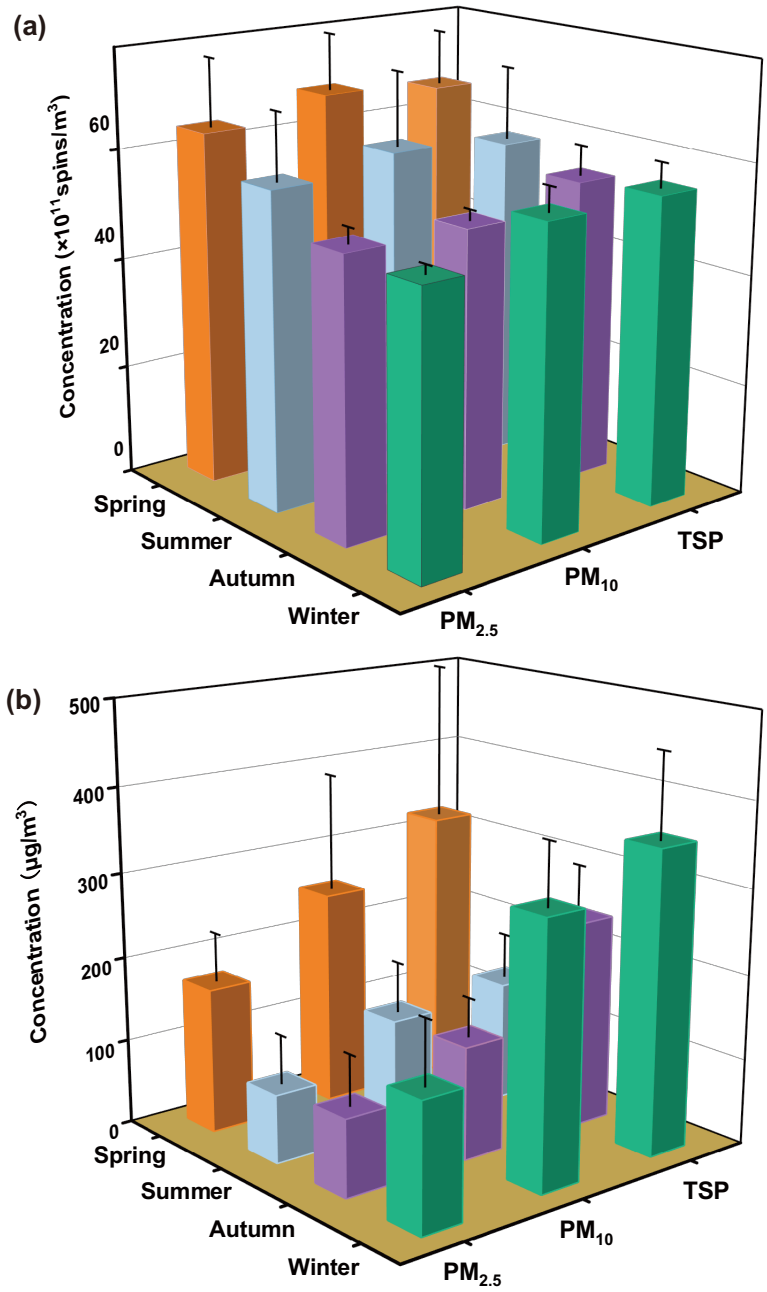

Figure S5. The concentrations of EPFRv (a) and PM (b) in different particle sizes in each season. The bars represent the standard deviations.

2. *In Section 3.3.2 and Fig. 4, the associations of OP with various chemical species are discussed. The OP values are in mass-normalized activities, while the chemical species are in ambient concentrations in m3. It would be helpful for the authors to explain why volume-*

normalized OP data were not utilized for the association discussion, which makes more sense to me.

Reply: In the revised manuscript, we have clarified in the text and the caption of Figure 4 that data of mass-normalized OP and mass fractions of chemical species were used for the correlation analyses. Mass-normalized OP represents the intrinsic redox properties of PM generated by chemical components. Volume-normalized OP is related to the actual exposure of the human body to redox-active substances. This work aims to identify individual chemical species influencing the intrinsic redox activity of ambient PM Therefore, correlation analyses between mass-normalized OP and mass fractions of chemical species were performed. We have clarified this point in the revised manuscript. Nevertheless, we have also included the correlation results between volume-normalized OP and chemical species per cubic meter of air in Figure S9 in the revised manuscript.

Line 283: To identify individual chemical species influencing the intrinsic redox activity of ambient PM, correlation analyses between mass-normalized OP ($OP^{DTT/\bullet OH}$) and the mass fraction of determined chemical species, were performed. The results are shown in Figure 4 and the detailed information is also listed in Tables S5–7 (the volume-normalized correlation results are also included in Figure S9 in case the readers are interested).

Line 305: **Figure 4.** Correlation coefficients (Pearson's r) of mass-normalized OP (Total/WS/WIS) with mass fractions of selected chemical species.

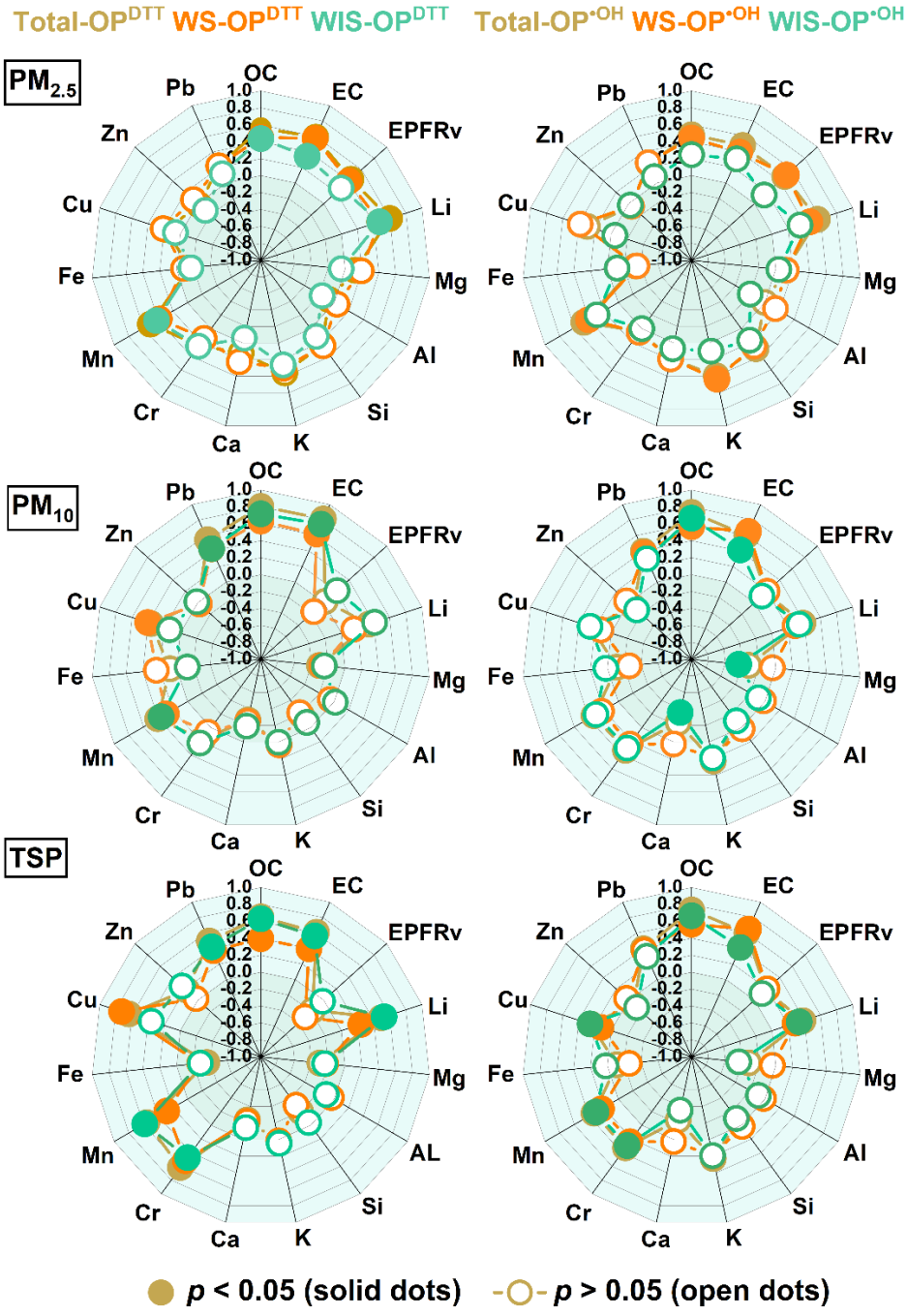

Figure S9. Correlation coefficients (Pearson's r) of volume-normalized OP (Total/WS/WIS) with selected chemical species per cubic meter of air.