Electronic Supplementary Material (ESI) for Nanoscale Advances.

Supporting Information

Electrospun Single-Phase Spinel Magnetic High Entropy Oxide Nanoparticles via Low-Temperature Ambient Annealing

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Supporting Table 1. Solubility of nitrate salt precursors. (Reference: chemister.ru Database)

Salt Precursors	Solubility Information	Decomposition Temp, °C
$Fe(NO_3)_3$	Soluble in water, alcohol, acetone.	141
$Co(NO_3)_2$	Soluble in water, alcohol, acetone and ammonia.	224
$Ni(NO_3)_2$	Soluble in ethanol, slightly soluble in acetone.	298
$Cr(NO_3)_3$	Soluble in water, acetone and ethanol.	155
$Cu(NO_3)_2$	Soluble in water, ethanol, ammonia.	175
$Mg(NO_3)_2$	Soluble in water, acid and alkali, ethanol, acetone.	435
$Zn(NO_3)_2$	Soluble in water and alcohol.	244
$Mn(NO_3)_2$	Soluble in water, ethanol, acetonitrile, tetrahydrofuran and ammonia.	180

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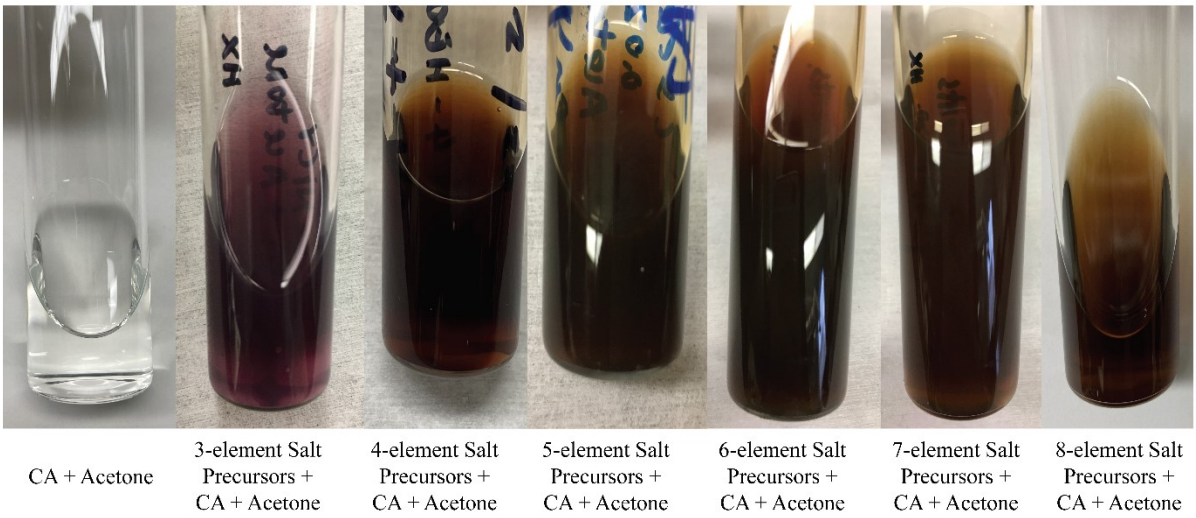


Supporting Figure 1. Digital photographs of CA solution and salt precursor solution including from 3 metal elements to 8 metal elements.

Supporting Table 2. Summary of calculated entropy of HEO NPs including from 3 metal elements to 8 mental elements.

Nanoparticles	Entropy
CoNiCr-O	1.187R
FeCoNiCr-O	1.247R
FeCoNiCrCu-O	1.432R
FeCoNiCrCuMg-O	1.662R
FeCoNiCrCuMgZn-O	1.823R
FeCoNiCrCuMgZnMn-O	2.012R

Simple-lattice model of configurational entropy in solid-solution model:

$S_{SS}^{config} = -R\sum_i X_i ln(X_i)$

where X_i is the mole fraction of each element.

Simple definition:

$S_{SS}^{config} = -Rln(n)$

where n is the number of components in the system.

X_i in the following calculations is from the EDS data.

3-HEO:

$$S_{SS}^{config} = -R\sum_i X_i \ln(X_i) = -R[0.1553 \times \ln(0.1553) + 0.1496 \times \ln(0.1496) + 0.1483 \times \ln$$
$$= 1.187R$$

4-HEO:

$$S_{SS}^{config} = -R\sum_i X_i \ln(X_i) = -R[0.1211 \times \ln(0.1211) + 0.1228 \times \ln(0.1228) + 0.1193 \times \ln$$
$$= 1.247R$$

5-HEO:

$$S_{SS}^{config} = -R\sum_i X_i \ln(X_i) = -R[0.0636 \times \ln(0.0636) + 0.1027 \times \ln(0.1027) + 0.1057 \times \ln$$
$$= 1.432R$$

6-HEO:

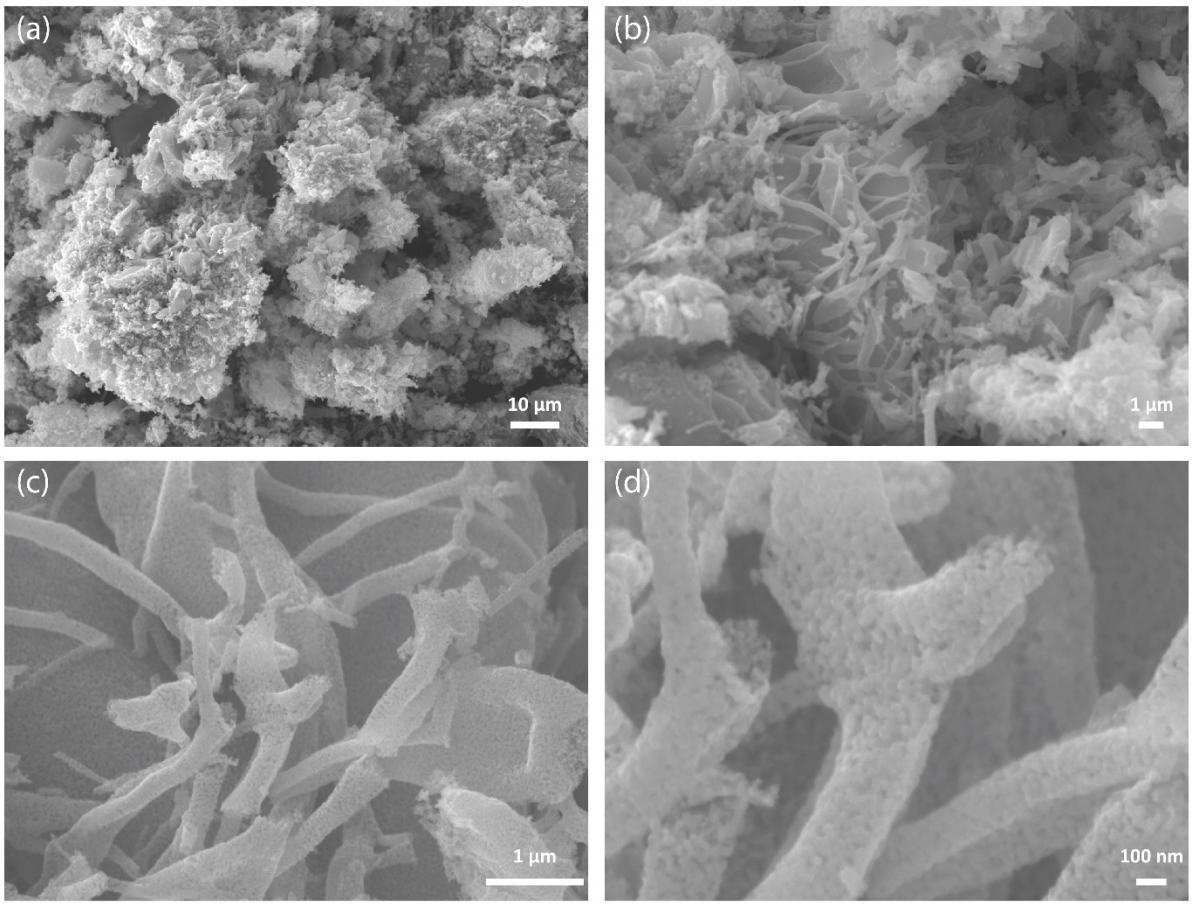
$$S_{SS}^{config} = -R\sum_i X_i \ln(X_i) = -R[0.0883 \times \ln(0.0883) + 0.0794 \times \ln(0.0794) + 0.0894 \times \ln$$
$$= 1.662R$$

7-HEO:

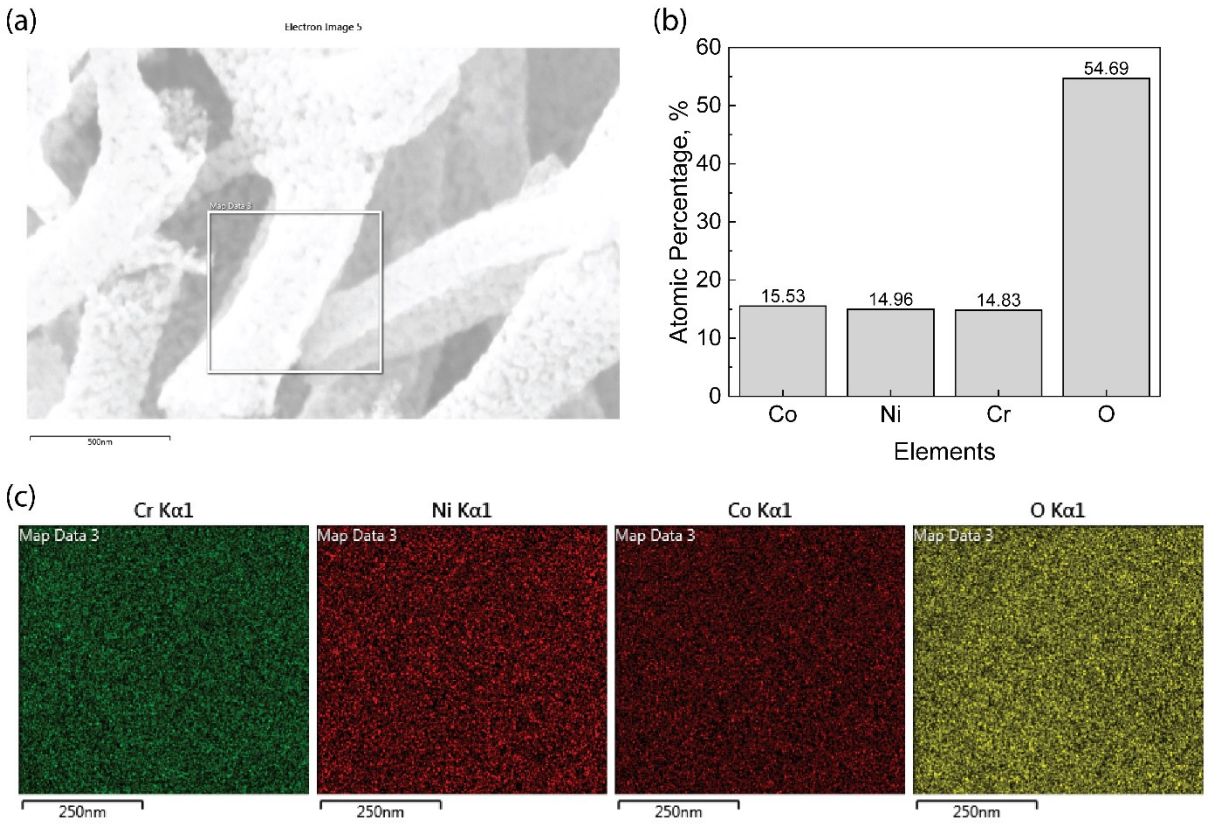
$$S_{SS}^{config} = -R\sum_i X_i \ln(X_i) = -R[0.0819 \times \ln(0.0819) + 0.0778 \times \ln(0.0778) + 0.0882 \times \ln$$
$$+ 0.0853 \times ln(0.0853) + 0.4068 \times ln(0.4068)$$
$$= 1.823R$$

8-HEO:

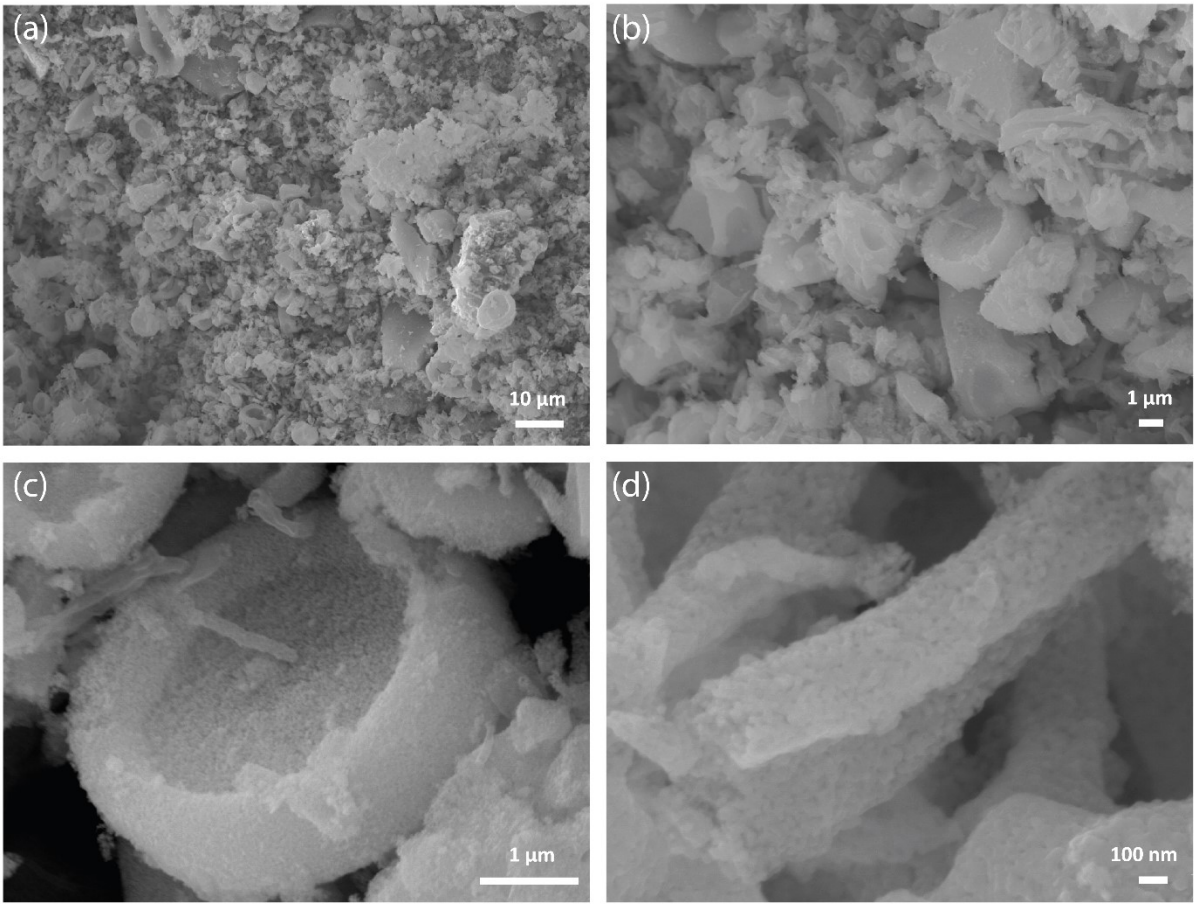
$$S_{SS}^{config} = -R\sum_i X_i \ln(X_i) = -R[0.096 \times \ln(0.096) + 0.088 \times \ln(0.088) + 0.088 \times \ln(0.088$$
$$+ 0.065 \times \ln(0.065) + 0.093 \times \ln(0.093) + 0.337 \times \ln(0.337)$$
$$= 2.012R$$



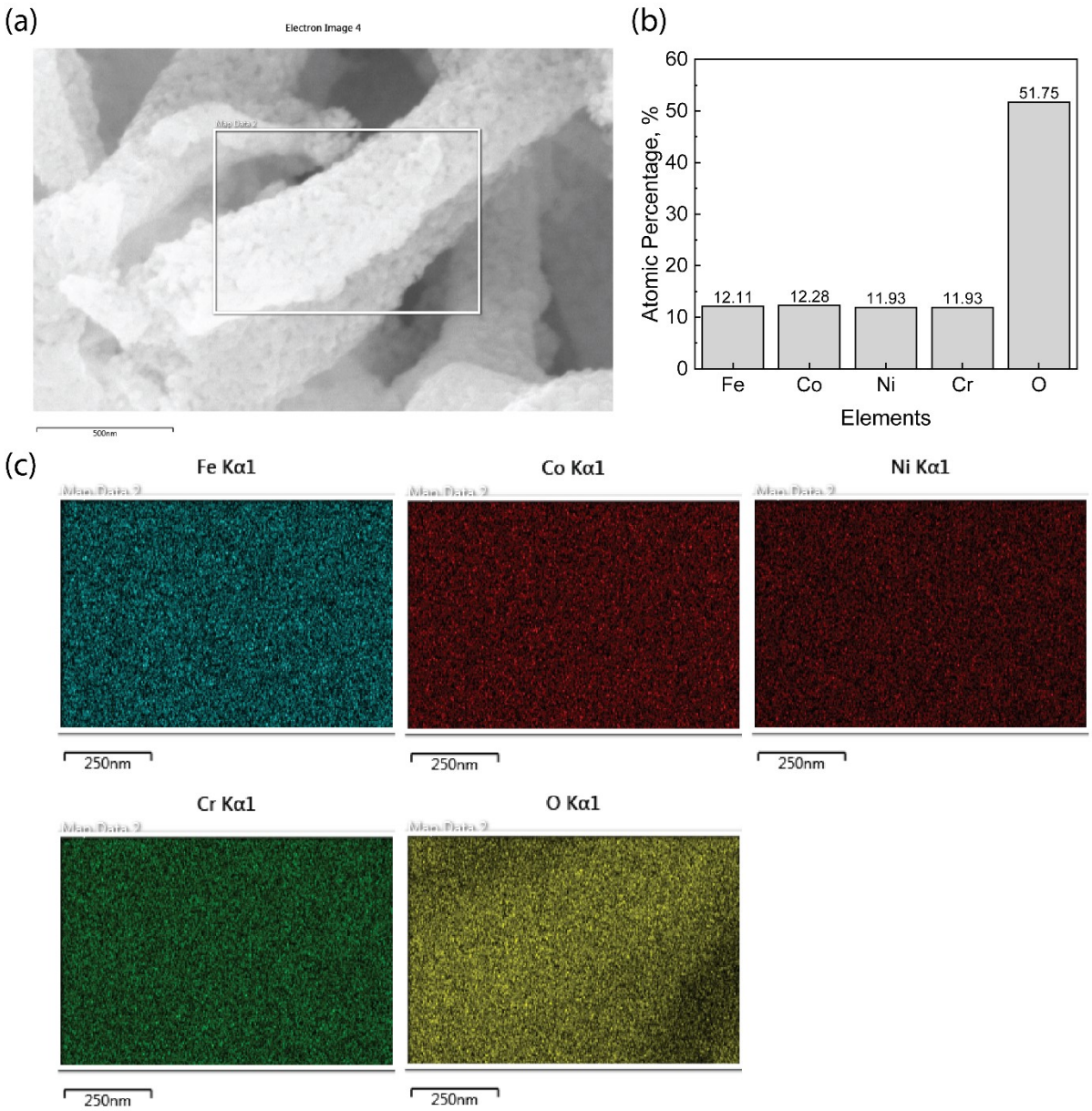
Supporting Figure 2. SEM of 3-HEO NPs.



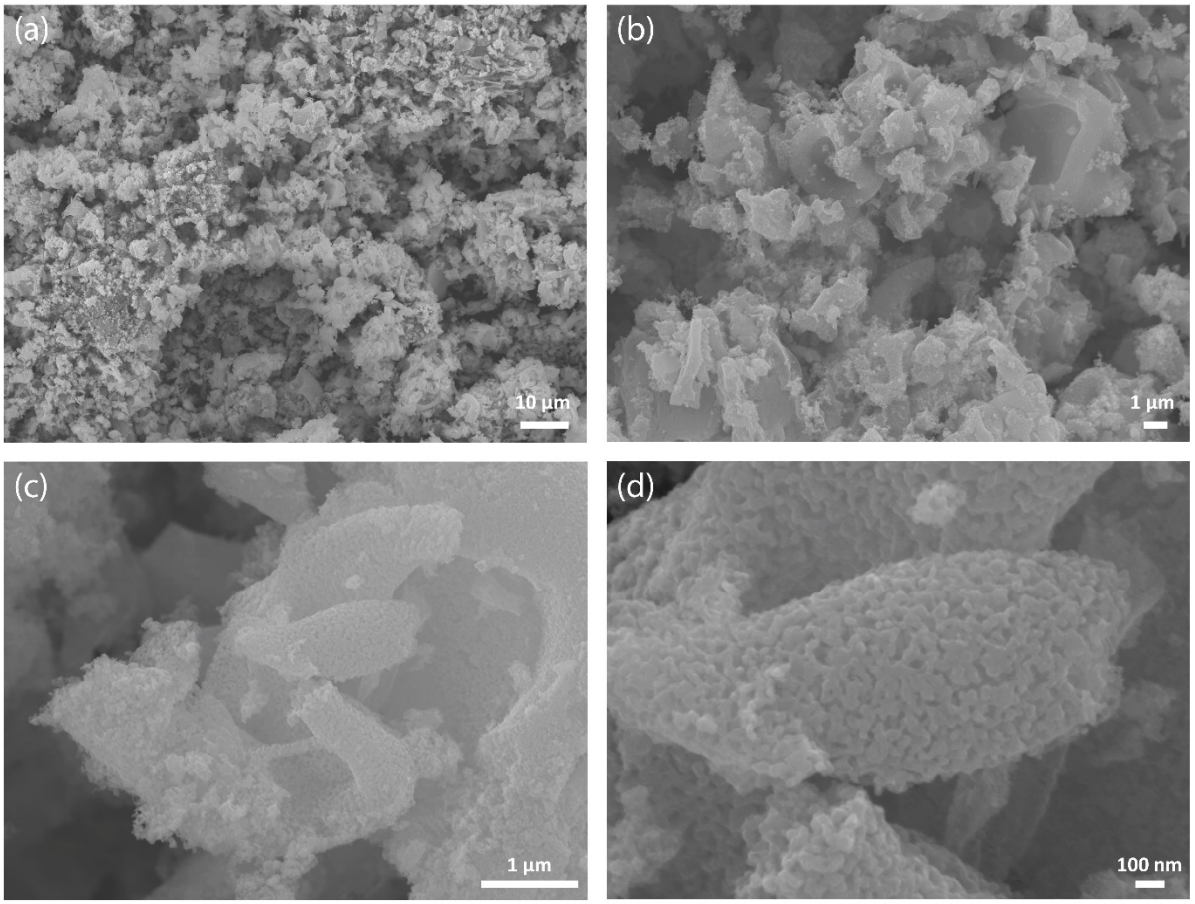
Supporting Figure 3. EDS of 3-HEO NPs. (a). EDS mapping of 3-HEO NPs. (b). Elemental composition of 3-HEO NPs. (c). EDS elemental mapping of three individual metal elements and oxygen.



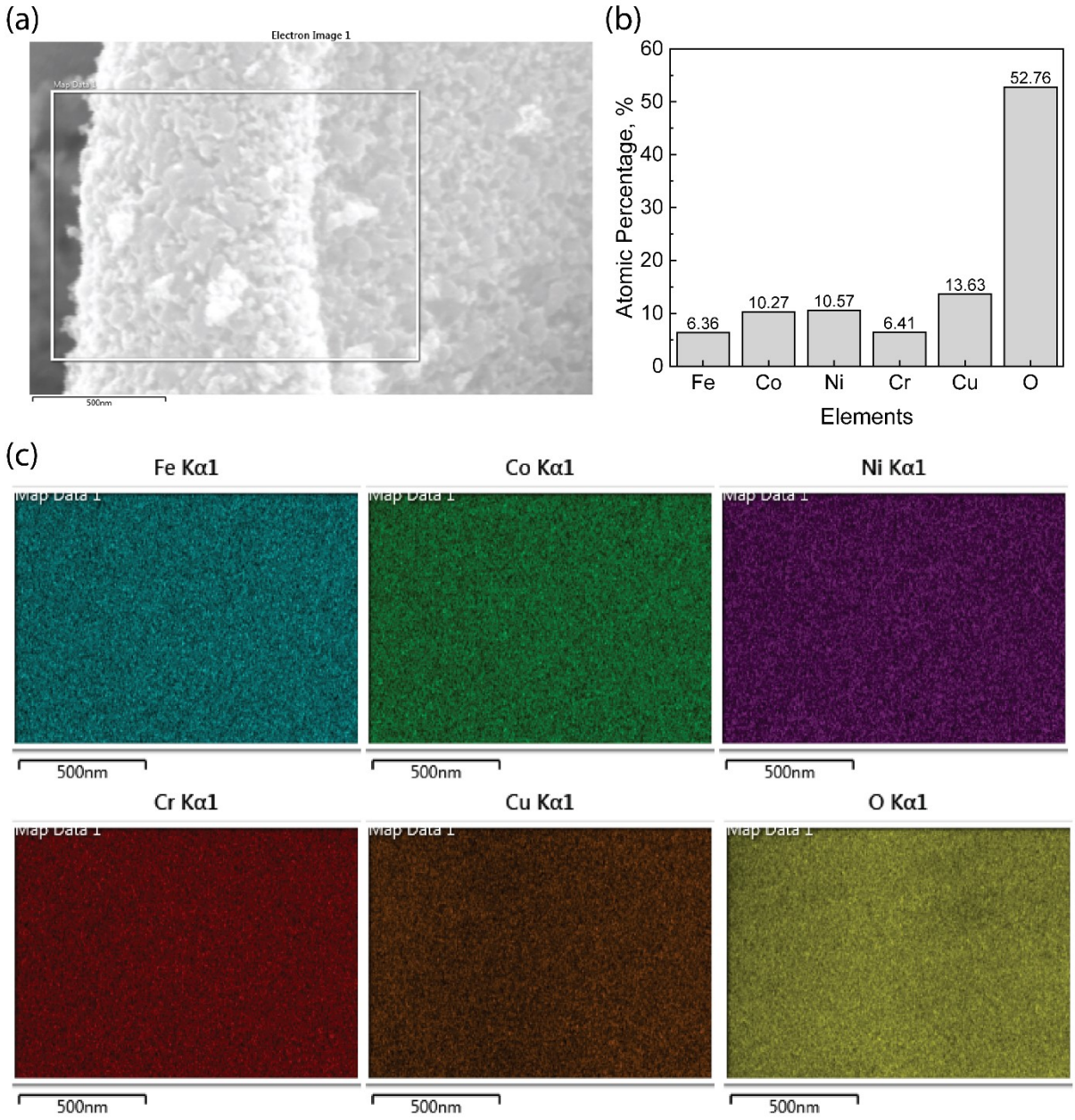
Supporting Figure 4. SEM of 4-HEO NPs.



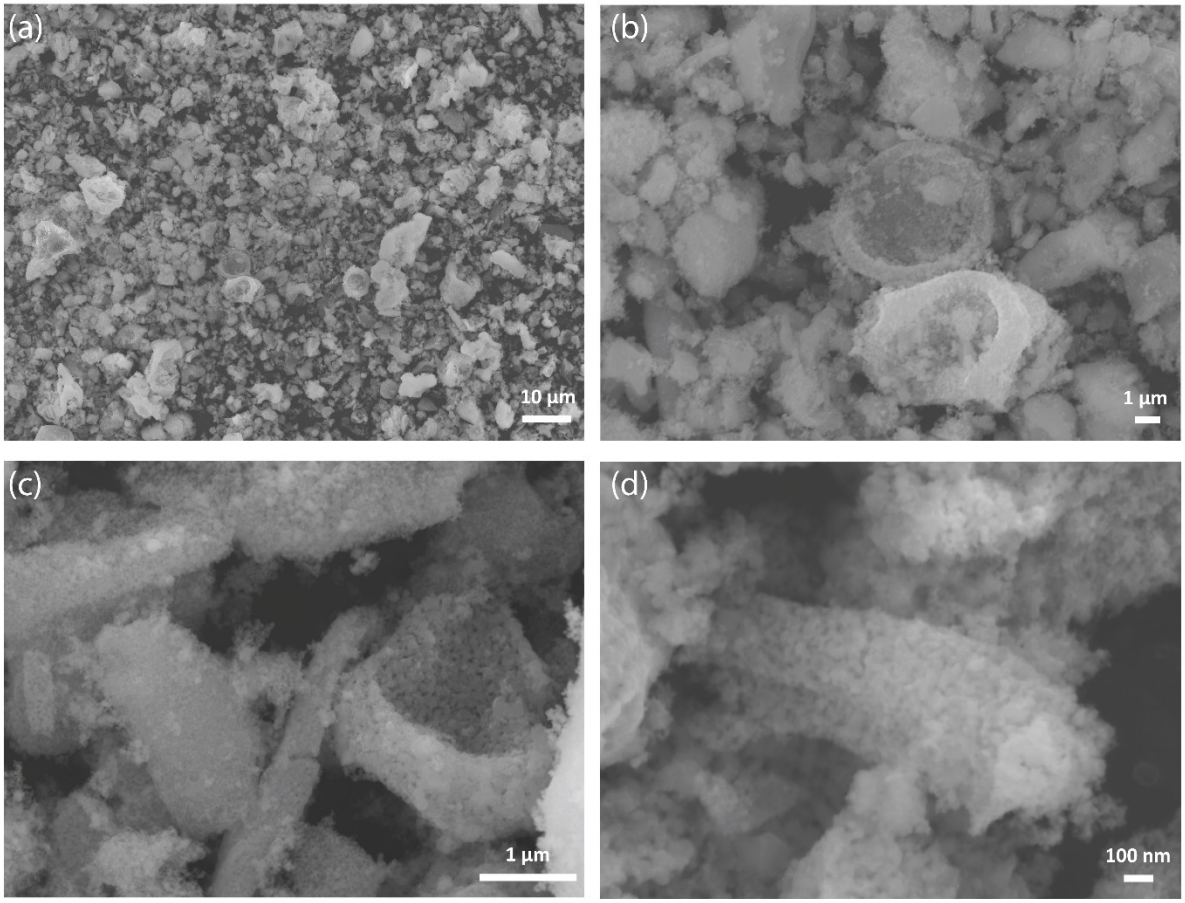
Supporting Figure 5. EDS of 4-HEO NPs. (a). EDS mapping of 4-HEO NPs. (b). Elemental composition of 4-HEO NPs. (c). EDS elemental mapping of four individual metal elements and oxygen.



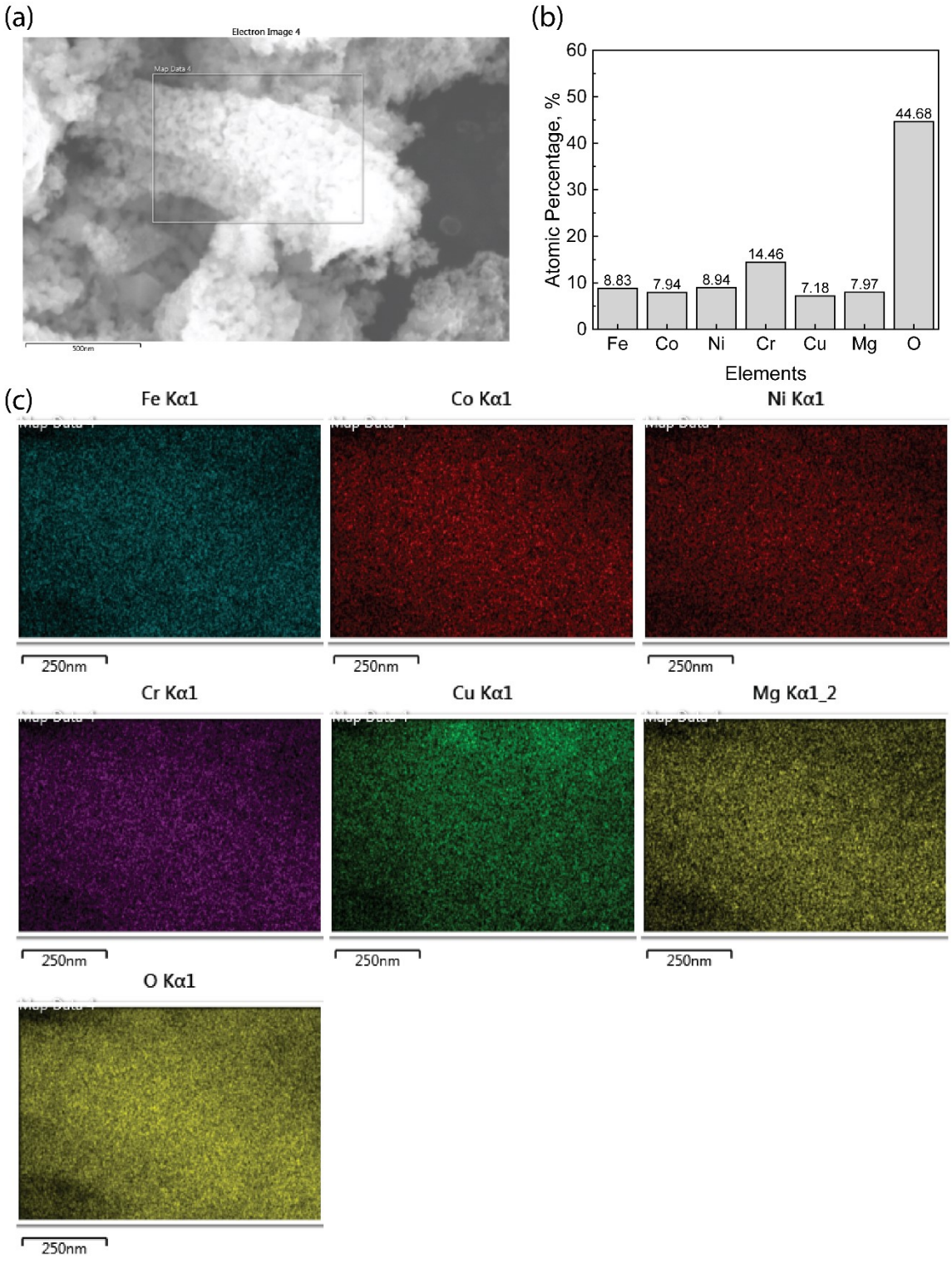
Supporting Figure 6. SEM of 5-HEO NPs.



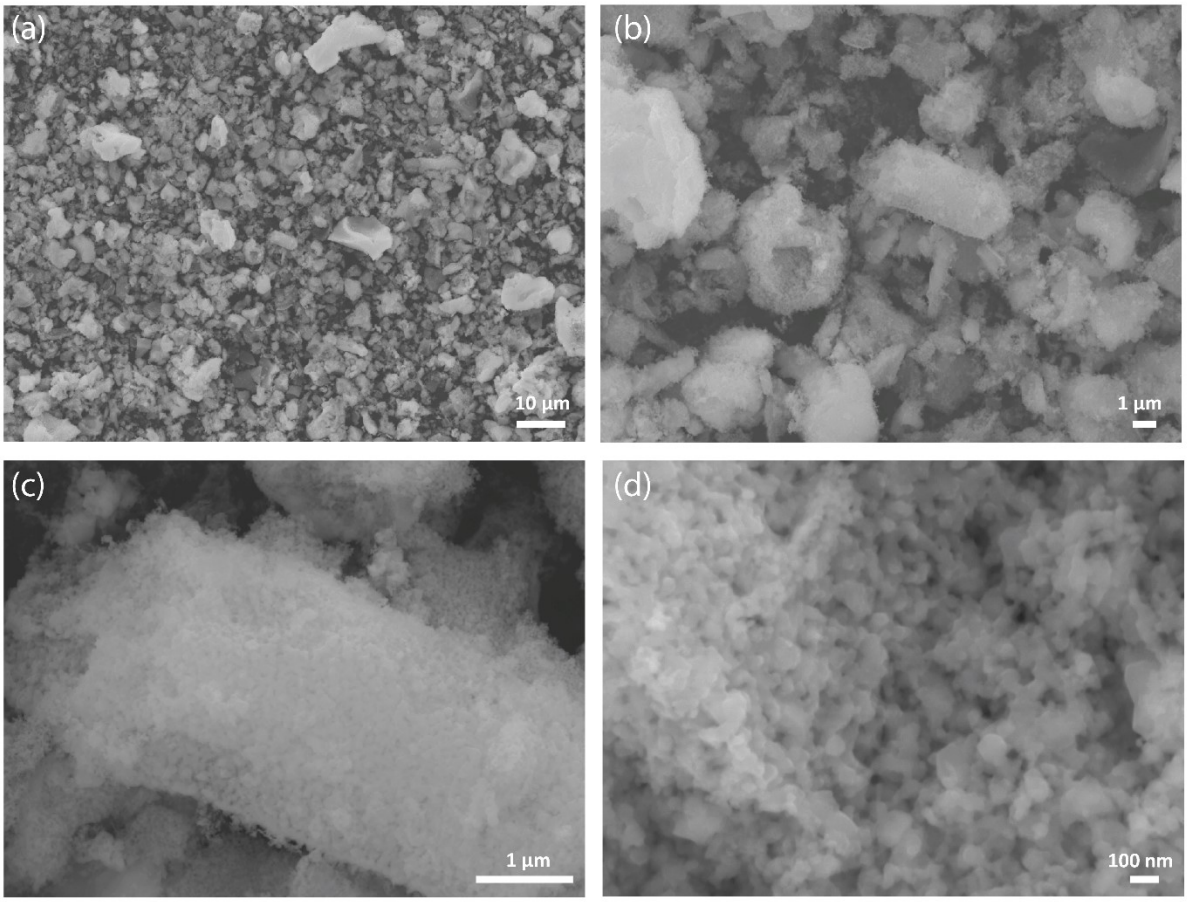
Supporting Figure 7. EDS of 5-HEO NPs. (a). EDS mapping of 5-HEO NPs. (b). Elemental composition of 5-HEO NPs. (c). EDS elemental mapping of all five individual metal elements and oxygen.



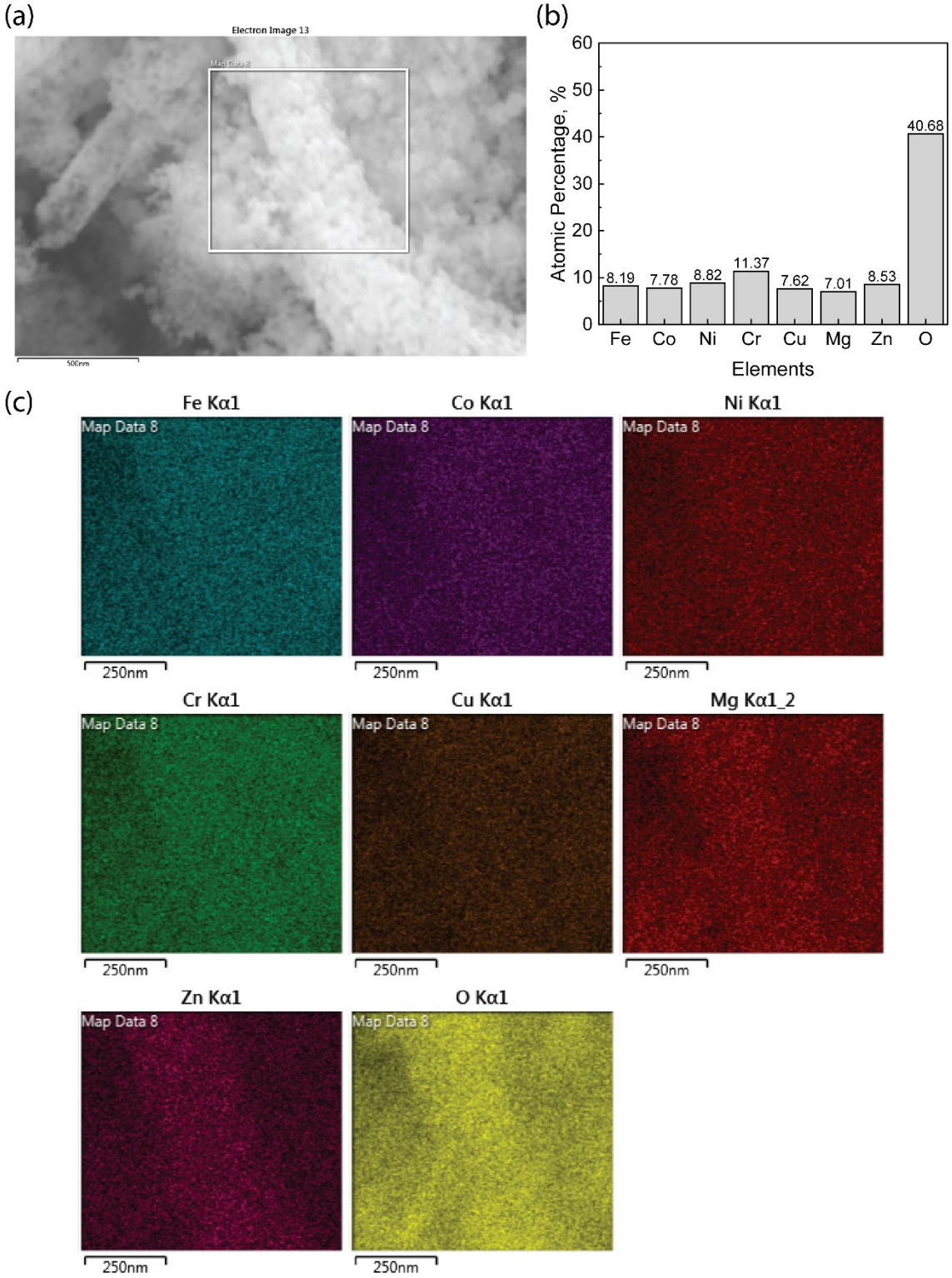
Supporting Figure 8. SEM of 6-HEO NPs.



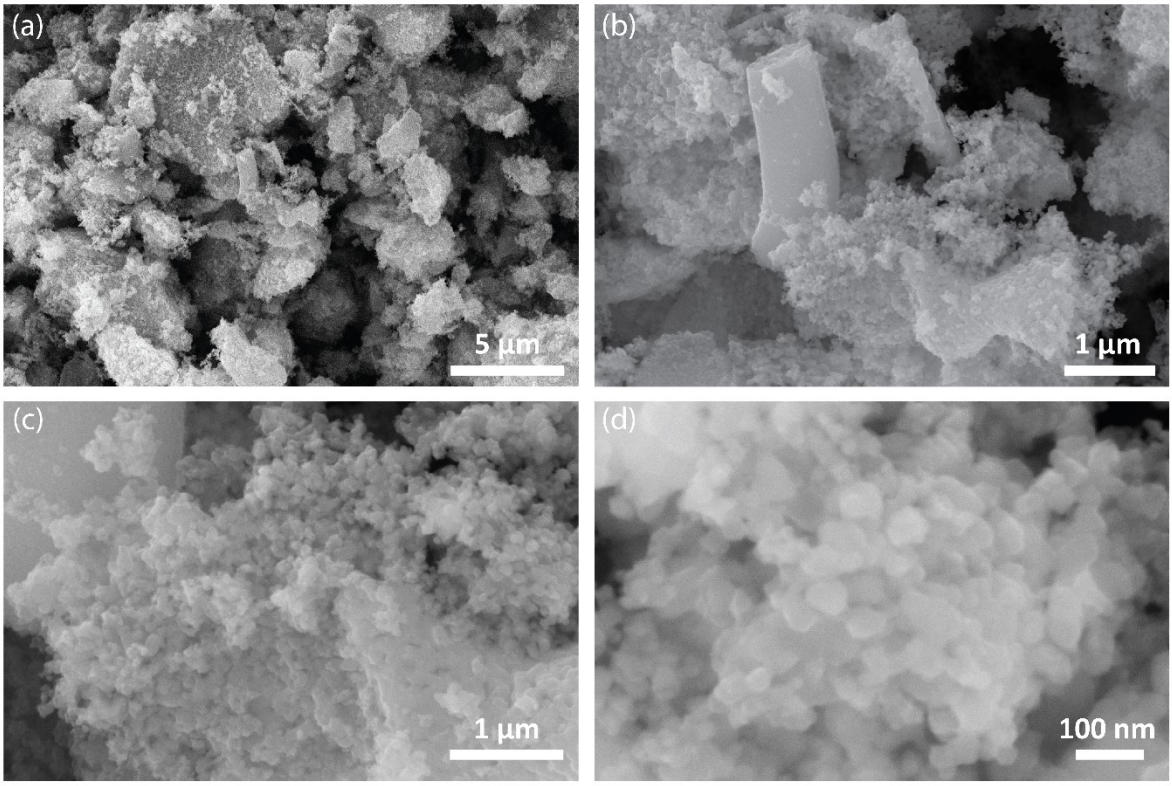
Supporting Figure 9. EDS of 6-HEO NPs. (a). EDS mapping of 6-HEO NPs. (b). Elemental composition of 6-HEO NPs. (c). EDS elemental mapping of all six individual metal elements and oxygen.



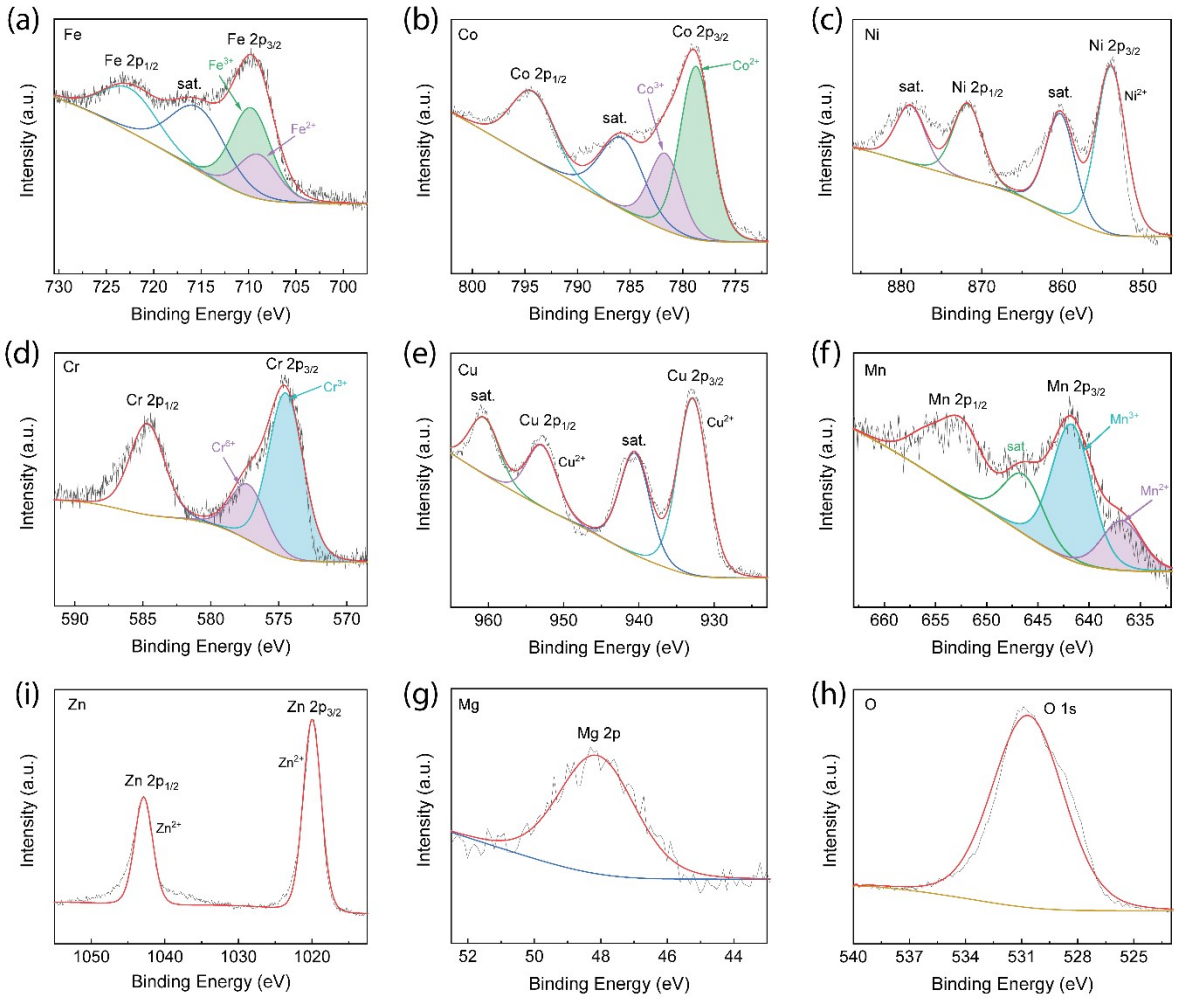
Supporting Figure 10. SEM of 7-HEO NPs.



Supporting Figure 11. EDS of 7-HEO NPs. (a). EDS mapping of 7-HEO NPs. (b). Elemental composition of 7-HEO NPs. (c). EDS elemental mapping of all seven individual metal elements and oxygen.



Supporting Figure 12. SEM of 8-HEO NPs.



Supporting Figure 13. XPS analysis of 8-HEO NPs.