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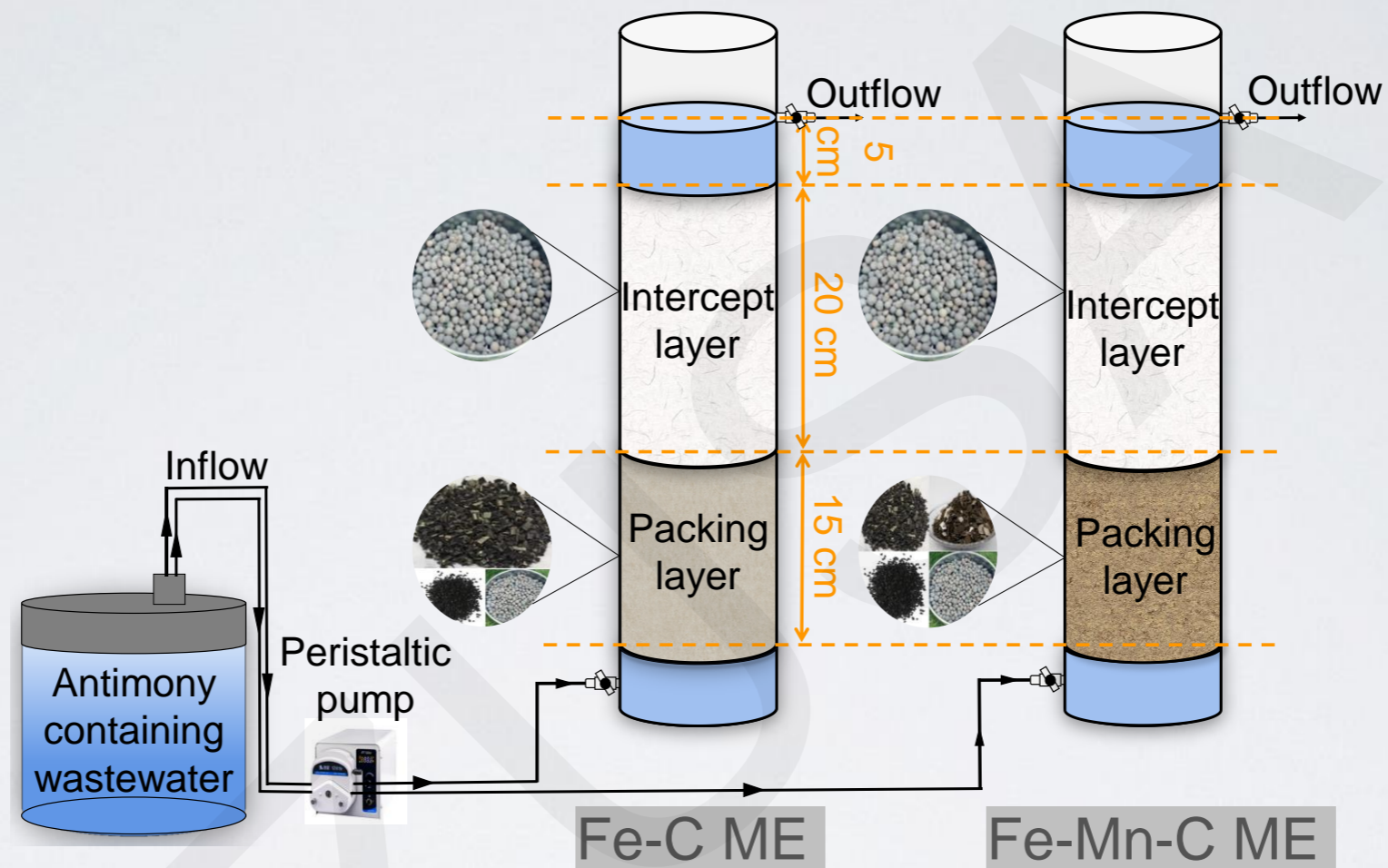
Effective removal of Sb(V) from aqueous solutions by micro-electrolysis with composite scrap iron-manganese as filler

Key words:

Antimony; Iron; Manganese; Micro-electrolysis (ME); Electrochemistry; Mechanism



Comparison of the removal effect of Sb(V)



HRT	Fe-C ME	Fe-Mn-C ME
8	66.0%	65.5%
10	68.0%	77.6%
12	72.3%	79.9%
16	80.1%	88.5%
24	79.1%	87.0%

Fe-Mn-C ME is 7.60%-9.67% higher than Fe-C ME

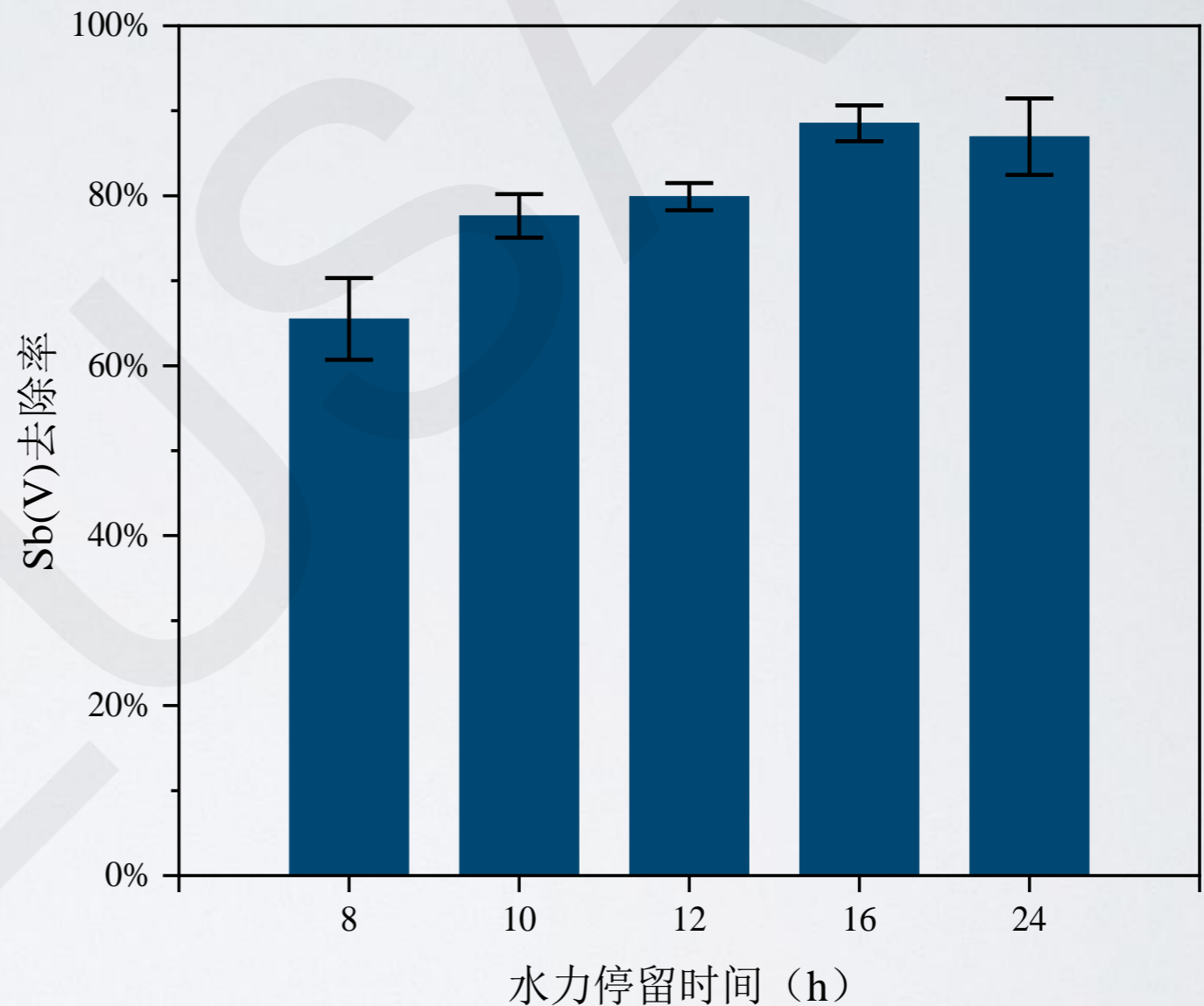
Mechanism of increased removal rate

Increase in potential difference

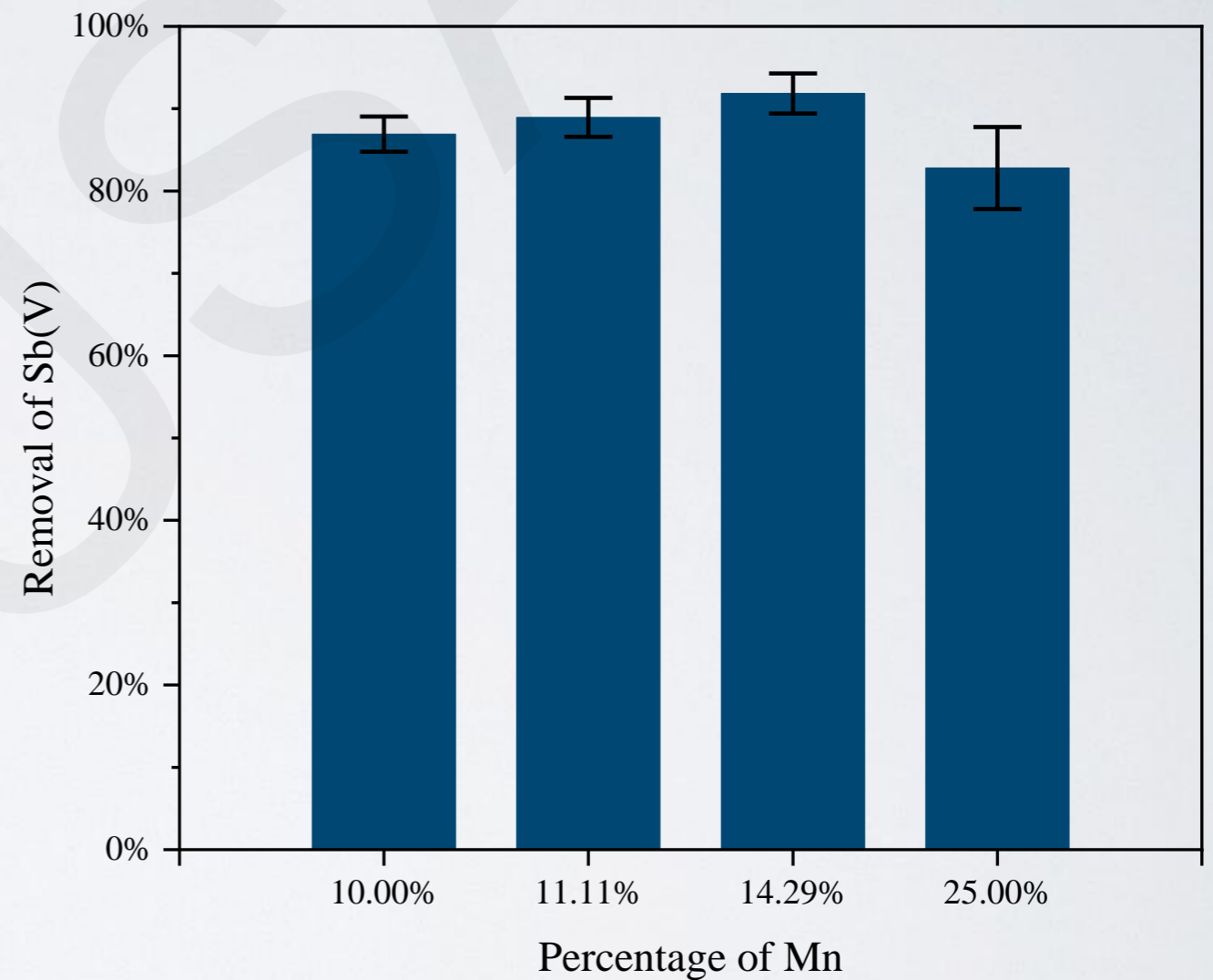
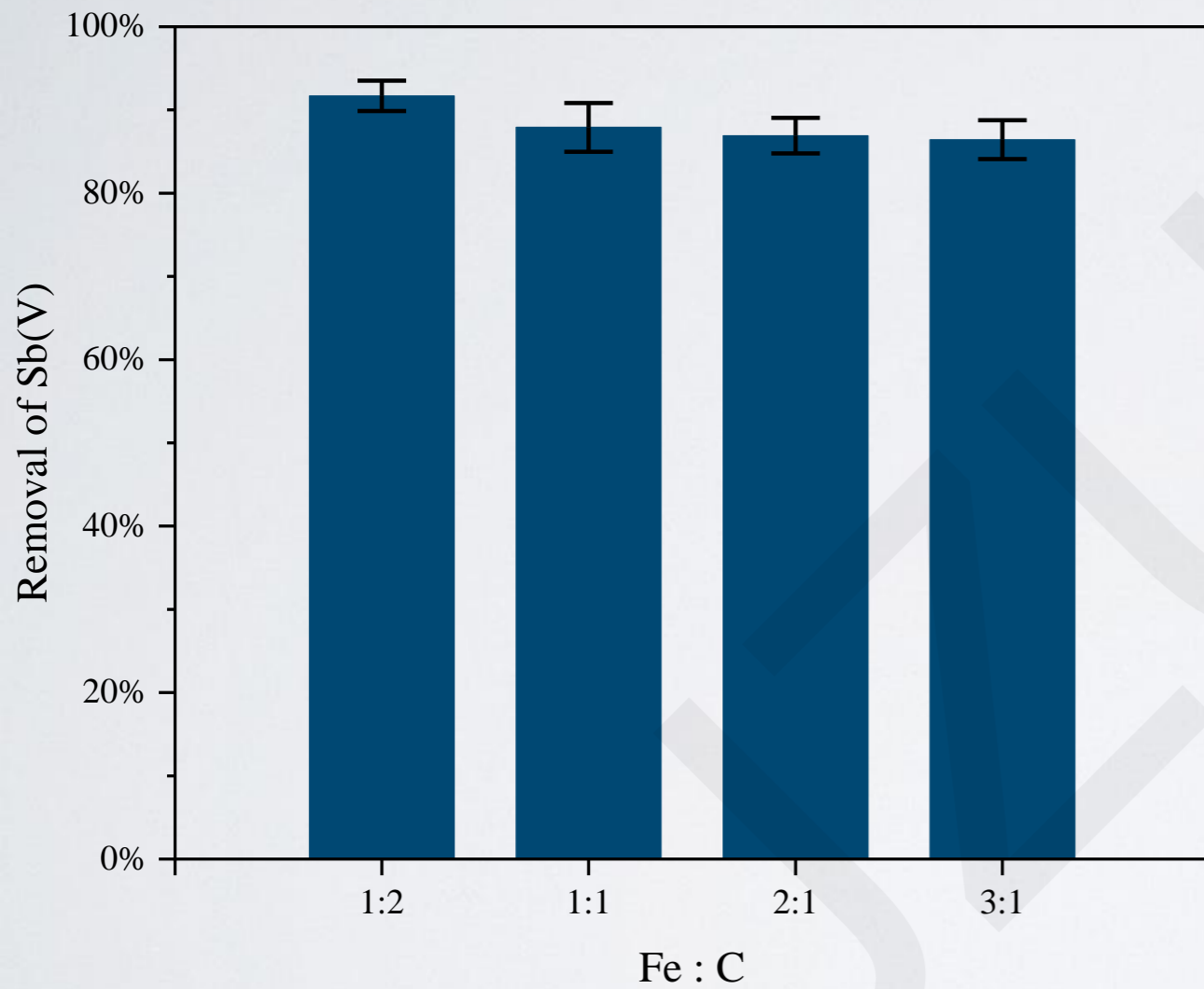
- The potential difference between Mn and C is three times that between Fe and C.
- The addition of Mn increases the potential difference of the electrolyte (Zheng Zibo et al., 2018)

Accidental Release

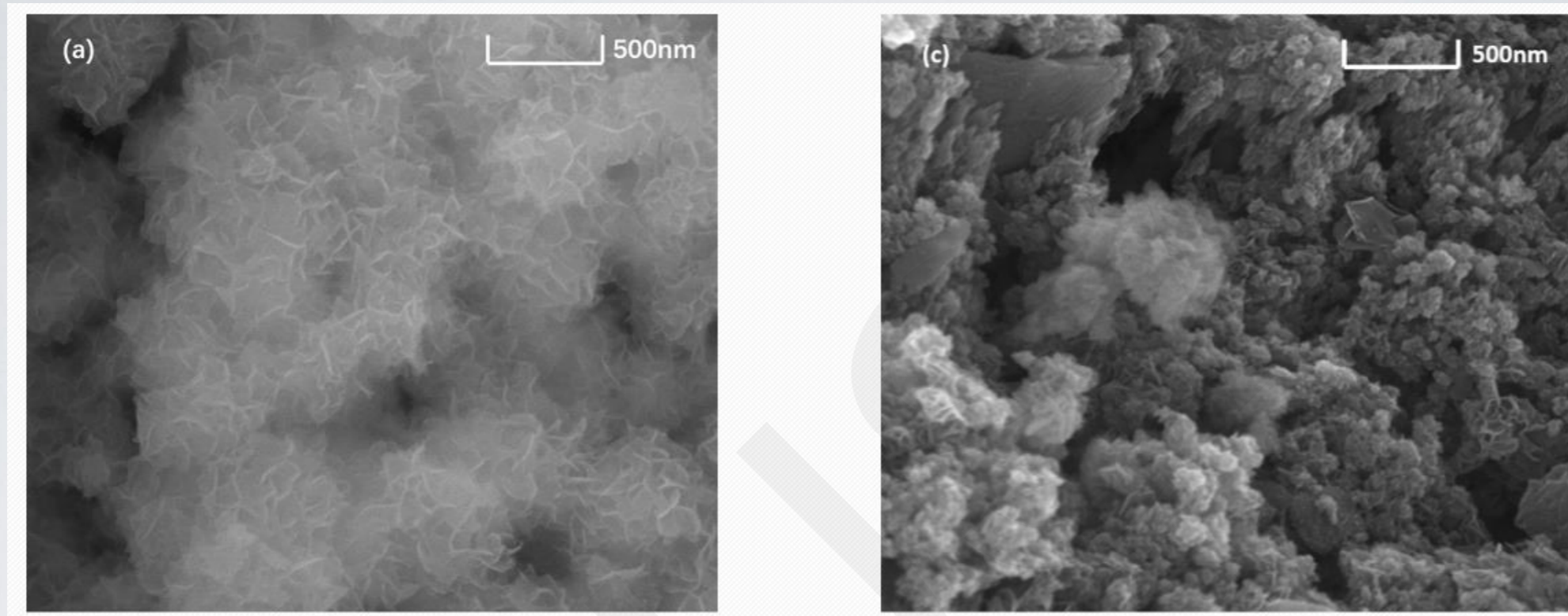
- Mn, as a good conductor of electricity, can promote the electron transfer between Fe and C, favoring the release of divalent iron ions (Jiang et al., 2017)



Effect of Fe/C Ratio and Mn Content Percentage on the Removal Rate



Characterization results



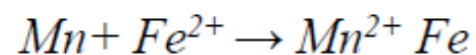
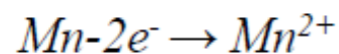
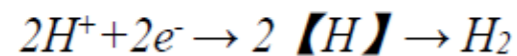
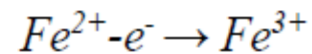
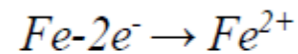
SEM images of flocs (a) ferromanganese flocs (Mn content 14.29%) (c) Fe flocs

Sample Type	BET Specific Surface Area (m ² /g)
Fe-Mn floc (Mn 14.29%)	130.79
Fe-Mn floc (Mn 25%)	121.36
Fe floc	117.67

- The larger the area of the floc, the better the adsorption performance and the higher the removal rate.
- The specific surface area of Fe flocculent is lower than that of Fe-Mn floc.

Mechanism of antimony removal by ferromanganese carbon microelectrolysis

Electrode reaction



Adsorption

Reduction

- ➔ ■ Sb(V) was removed by adsorption of iron-manganese composite double hydroxide flocs
- Sb(V) was reduced to Sb(III), and Sb(OH)₃ precipitate was generated during the coagulation process, which was removed by the adsorption and co-precipitation reaction of the floc.

