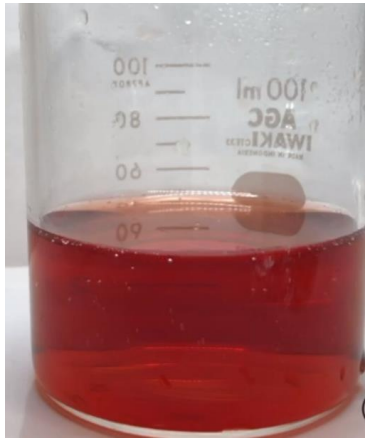
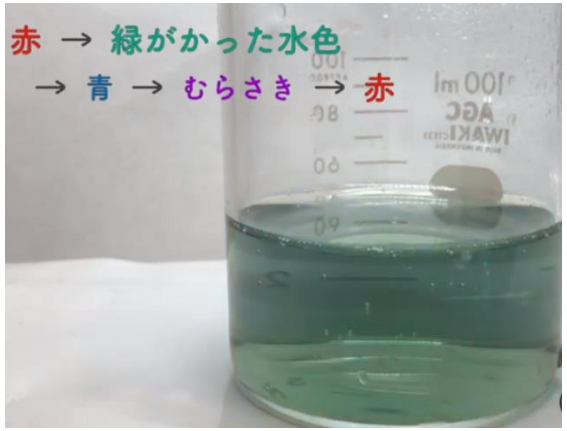
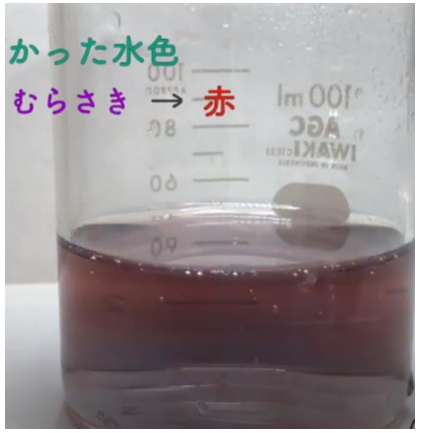
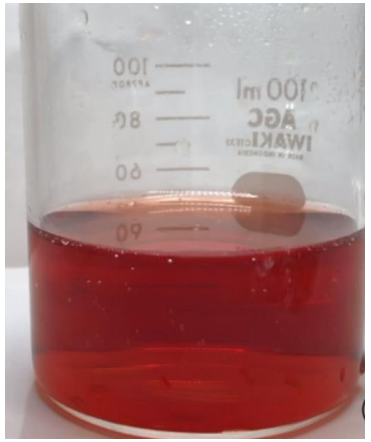
ベロウソフ・ジャボチンスキー反応

出典：https://www.youtube.com/watch?v=BZxGpwNMzts









出典：https://www.youtube.com/watch?v=eXL6jhe8S-w

ベロウソフ・ジャボチンスキー反応

$$5HOOCCH_2COOH + 3Br_3^- + 3H^+ \rightarrow 3HOOCCHBrCOOH + 2HCOOH + 4CO_2 + 5H_2O$$

	酸化数 3		1		0
Br_3^-	→	$HBrO_2$	→	$HOBr$	→	Br_2
臭素酸塩		亜臭素酸		次亜臭素酸		臭素

① $Br_3^- + 5Br^- + 6H^+ \rightarrow 3Br_2 + 3H_2O$

② $Br_3^- + 4Ce^{3+} + 5H^+ \rightarrow 4Ce^{4+} + HOBr + 2H_2O$

③ $HOOCCH_2COOH + Br_2 \rightarrow HOOCCHBrCOOH + H^+ + Br^-$

④ $HOOCCH_2COOH + 6Ce^{4+} + 2H_2O \rightarrow HCOOH + 2CO_2 + 6Ce^{3+} + 6H^+$

⑤ $HOOCCHBrCOOH + 4Ce^{4+} + 2H_2O \rightarrow HCOOH + 2CO_2 + 4Ce^{3+} + Br^- + 5H^+$

Br^-が消失すると①の還元は停止
②の反応が急激に生じ、酸化型金属増
③～⑤により還元型金属になりBr^-増

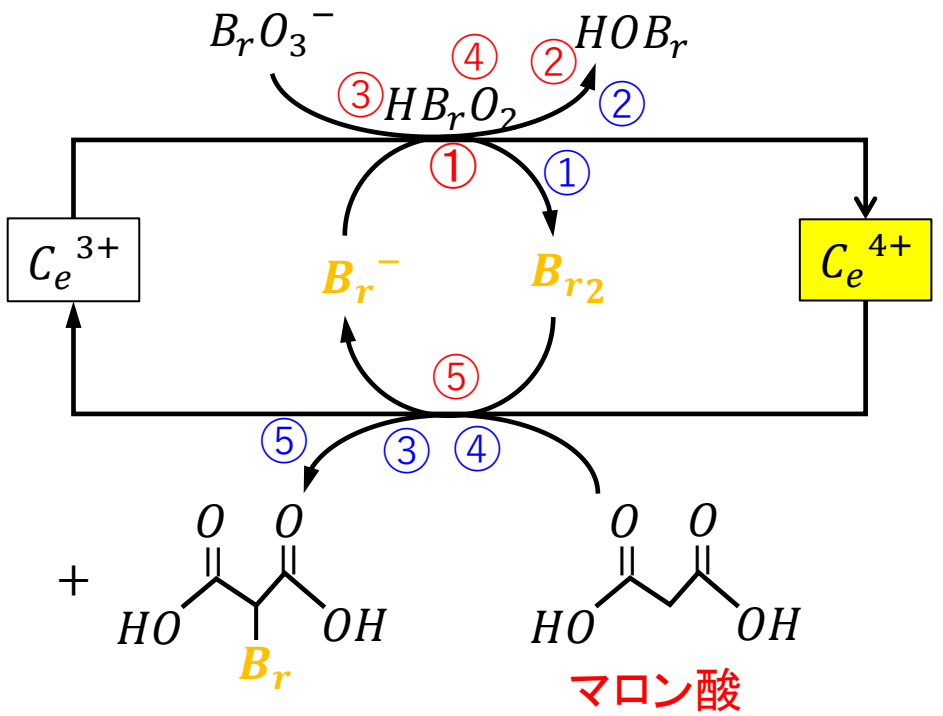
① $Br_3^- + Br^- + 2H^+ \rightarrow HBrO_2 + HOBr$

② $HBrO_2 + Br^- + H^+ \rightarrow 2HOBr$

③ $Br_3^- + HBrO_2 + 2Ce^{3+} + 3H^+ \rightarrow 2HBrO_2 + 2Ce^{4+} + H_2O$

④ $2HBrO_2 \rightarrow Br_3^- + HOBr$

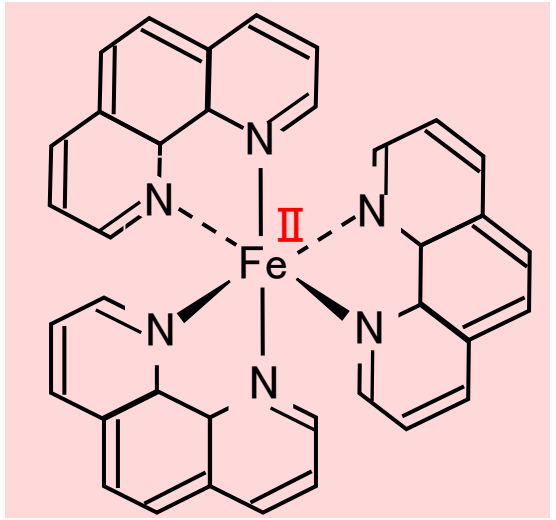
⑤ $HOOCCH_2COOH + Br_2 + 4Ce^{4+} + 2H_2O$
$\rightarrow HCOOH + 2CO_2 + 4Ce^{3+} + 2Br^- + 6H^+$



酸化還元指示薬

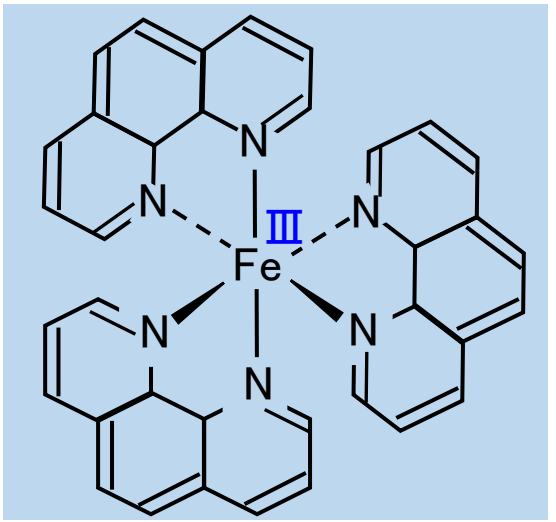
フェナントロリン鉄錯体

赤

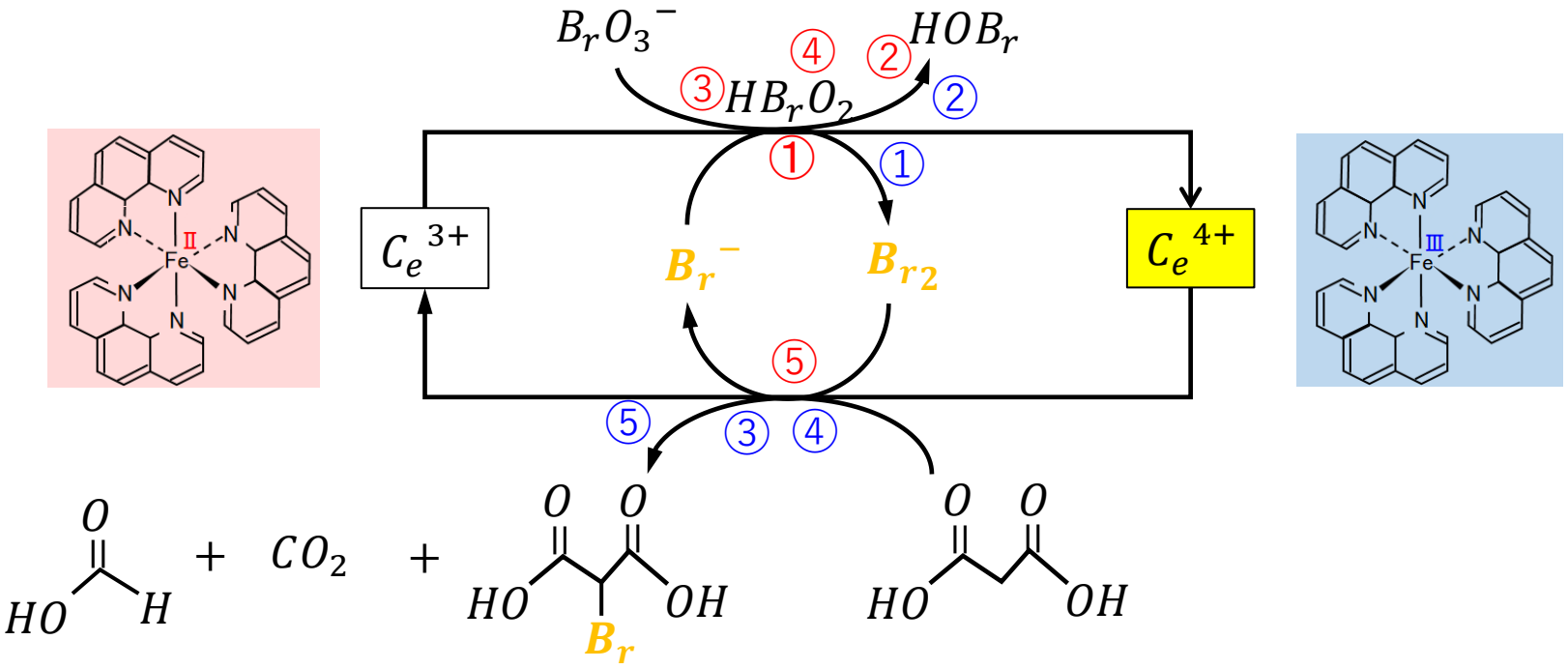


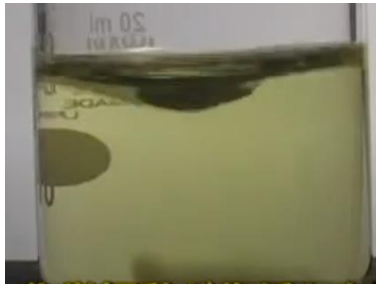
−e

+e



青

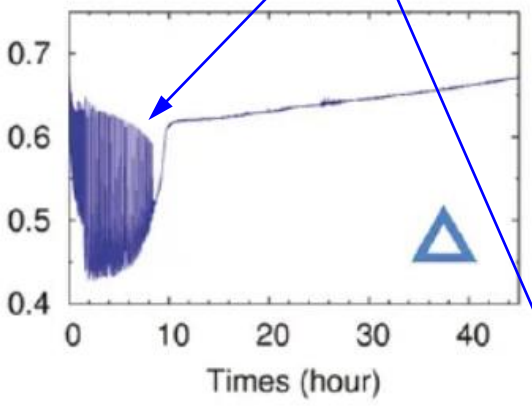




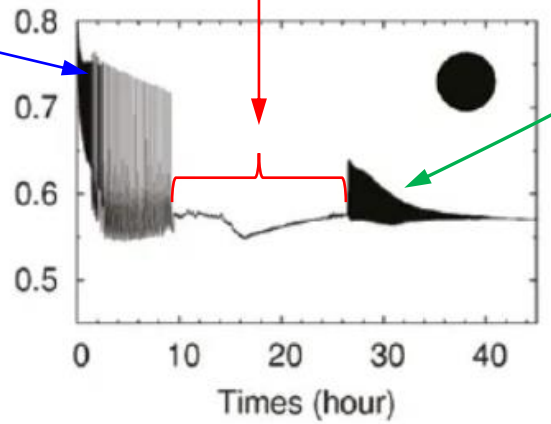
停止期間

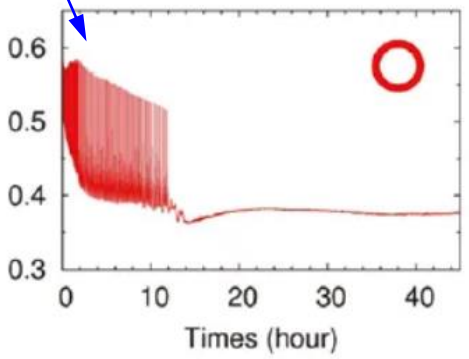
振動復活

酸化還元電位

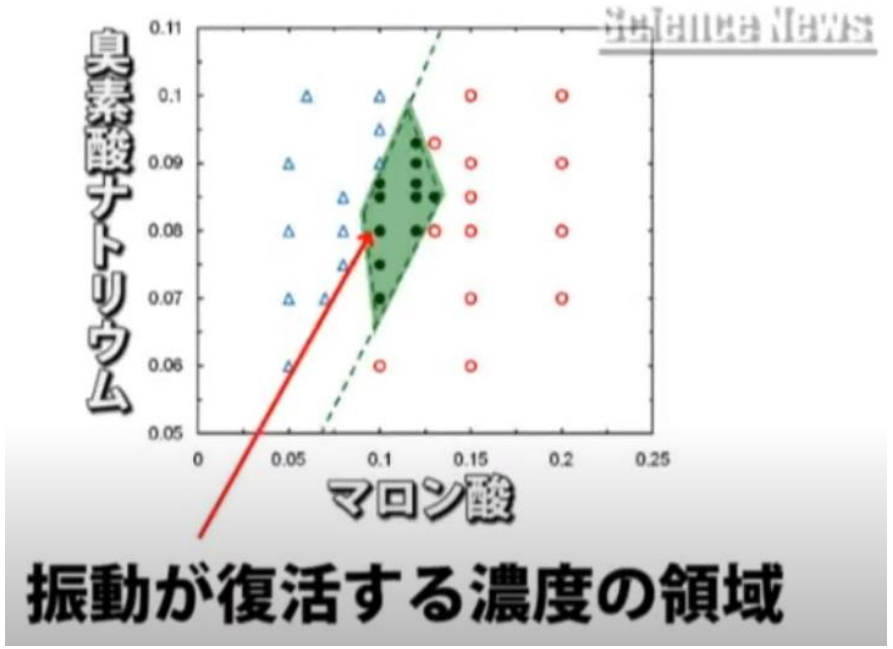


高め安定





低め安定



出典：https://www.youtube.com/watch?v=kJoTL3fp-Wo

Onuma, H.; Okubo, A.; Yokokawa, M.; Endo, M.; Kurihashi, A.; Sawahata, H. *J. Phys. Chem. A* **2011**, *115*, 14137–14142.
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