

Ethanol formation during room temperature degradation of  $\text{CF}_4$  by using electron mediator  
 $\text{Cu}^{1+} [\text{Ni}^{2+} (\text{CN})_4]^{1-}$  at electro-scrubbing process

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Degradation of  $\text{CF}_4$  by using presently available methods ended up with another kind of greenhouse gas and corrosive side products. This investigation aimed to develop  $\text{CF}_4$  removal at room temperature with formation of useful product by attempting an electrogenerated  $\text{Cu}^{1+} [\text{Ni}^{2+} (\text{CN})_4]^{1-}$  mediator. The electrolysis of bimetallic complex at anodized Ti cathode demonstrated the  $\text{Cu}^{1+} [\text{Ni}^{2+} (\text{CN})_4]^{1-}$  formation, which was confirmed by additional ESR results. Then the electrogenerated  $\text{Cu}^{1+} [\text{Ni}^{2+} (\text{CN})_4]^{1-}$  used to degrade  $\text{CF}_4$  in the form of mediated electrochemical reduction (MER). The removal efficiency of  $\text{CF}_4$  was achieved 95% by this present electroscrubbing process at room temperature. Through the spectral results of online and offline FTIR analyzer either in gas or in solution phase demonstrated that the formed major product during the removal of  $\text{CF}_4$  by electrogenerated  $\text{Cu}^{1+} [\text{Ni}^{2+} (\text{CN})_4]^{1-}$  at electroscrubbing was ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ ).

Key words: Bimetallic mediator,  $\text{Cu}^{1+} [\text{Ni}^{2+} (\text{CN})_4]^{1-}$ , MER,  $\text{CF}_4$  degradation; Ethanol formation