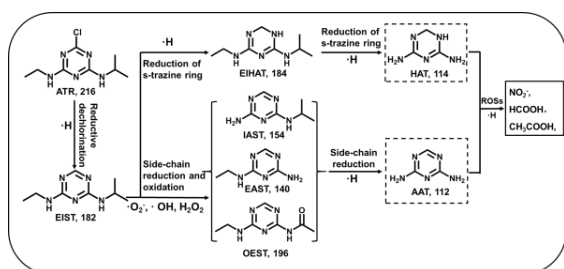


## Ni(II) Induced Enhancement of Aerobic Atrazine Degradation with Core-Shell Fe@Fe<sub>2</sub>O<sub>3</sub> Nanowires

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In general, the final product of atrazine degradation by reactive oxygen species is cyanuric acid (OOC) with s-triazine ring that is too stable to be destroyed under mild oxidative conditions. In this study, we demonstrate that the presence of Ni(II) can realize the recalcitrant s-triazine ring cleavage and significantly increase the aerobic atrazine degradation rate by 6 times with core-shell Fe@Fe<sub>2</sub>O<sub>3</sub> nanowires (CSFN/Ni(II)/Air). The generation of formic acid and nitrite acid during the aerobic atrazine degradation process suggested the mineralization of nitrogen and carbon in the s-triazine ring, the compound-specific stable isotope  $\delta^{13}\text{C}$  analysis and the precise surface enhanced Raman spectrum analysis confirmed the cleavage of the s-triazine ring in the CSFN/Ni(II)/Air system. A possible mechanism of the aerobic atrazine degradation and the s-triazine ring cleavage was proposed on the base of experimental results. The additional Ni(II) adsorbed on the surface of the CSFN was in-situ reduced to Ni(0) and subsequently catalytically produce active hydrogen, altering the atrazine degradation pathway to reductive generation of N<sup>2</sup>-ethyl-N<sup>4</sup>-isopropyl-1, 3, 5-triazine-2, 4-diamine intermediate which is more easily to be ring-opened than OOC generated under oxidative conditions. This research provides an approach to realize the ring-opening of the s-triazine herbicides under facile condition by tuning the degradation pathways, as well sheds light on boosting iron-based environmental remediation technology.



**Figure 1.** Proposed ATR degradation pathway treated with CSFN/Ni(II)/Air system.