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酸活化赤泥催化臭氧氧化降解水中硝基苯的效能研究

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摘要:以铝工业废物赤泥为原料,采用酸化的方法活化赤泥,提高其在多相催化臭氧氧化除污染体系中的催化活性,并对其催化臭氧除污染效能及机制进行探讨.研究发现,和赤泥原矿相比,酸化赤泥表现出十分显著的催化能力;酸化赤泥(RM6.0)催化臭氧氧化硝基苯的去除率随臭氧浓度的增加而增加;当臭氧浓度由 0.4 mg·L⁻¹增加至 1.7 mg·L⁻¹时,硝基苯的去除率由 45%提高到 92%.溶液 pH 对 RM6.0 催化体系利用臭氧能力的影响与其催化臭氧氧化降解 NB 的影响表现出一致的结果.初始 pH 变化所带来的 RM6.0 催化活性的变化,主要是由于体系中氢氧根浓度的变化,导致臭氧分解形成羟基自由基所致;过高 pH 值导致的羟基自由基的猝灭显促使 RM6.0 催化臭氧氧化 NB 活性的降低.通过 RM6.0 对臭氧的利用能力及羟基自由基抑制实验结果发现,RM6.0 催化臭氧降解 NB 的主要作用机制是催化剂表面吸附臭氧,实现臭氧在催化剂表面的富集,进而实现对 NB 有机污染物的氧化降解.在这个过程中羟基自由基是存在的,主要是在臭氧与硝基苯在界面氧化过程中分解而成,并进一步氧化 NB.

关键词:臭氧;赤泥;催化臭氧氧化;硝基苯;羟基自由基

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Catalytic Ozonation of Nitrobenzene in Water by Acidification-activated Red Mud

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Abstract: Red mud as one kind of aluminum industrial wastes was used as raw material for catalyst preparation. It was activated by acidification in order to enhance its catalytic activity in the system of catalytic ozonation. Furthermore, removal performance and reaction mechanism in degradation of organic pollutants were discussed. Results showed that acid modified red mud had more significant catalytic activity than the raw red mud. The removal efficiency of nitrobenzene by catalytic ozonation with acidified red mud (RM6.0) increased with the increasing ozone concentration. When the ozone concentration was increased from 0.4 mg·L⁻¹ to 1.7 mg·L⁻¹, the removal efficiency of nitrobenzene increased from 45% to 92%. There was a consistent effect of water pH on the removal efficiency and the ozone concentration variation. The variation of the removal efficiency depended on the initial water pH. This was because the concentration of OH⁻ led to ozone decomposition to generate hydroxyl radicals. The higher water pH value led to the quenching of hydroxyl radicals, resulting in the reduction of catalytic activity of RM6.0. The experimental results of aqueous ozone concentration variation in the presence of RM6.0 and inhibition by hydroxyl radicals indicated that the main reaction mechanism was catalytic ozonation of NB. Firstly, aqueous ozone was absorbed onto the surface of RM6.0, and then the concentrated ozone oxidized NB in water which was with a combination of direct and indirect oxidation. In catalytic reaction, hydroxyl radicals were present, which were generated during the oxidation of NB on the surface of RM6.0.

Key words: ozone; red mud(RM); catalytic ozonation; nitrobenzene(NB); hydroxyl radicals

近年来,随着大量化工合成产品在人们日常生活及工农业生产中的应用,水环境中难降解有机污染物种类和含量明显增加^[1].由于常规污水处理工艺对难降解有机污染物的去除能力十分有限,且对污水生物处理单元构成生物中毒,导致其除污染水平大幅度下降.因此,必须借助深度处理技术来进一步提高出水水质.多相催化臭氧氧化技术是水处理高级氧化技术的一种,它将臭氧的强氧化能力^[2]、催化剂的表面性质^[3]、吸附特性^[4]和氧化

性^[5]结合起来,可以强化臭氧对难降解有机污染物的氧化去除能力,是目前受到广泛关注的一种水深度处理技术.

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作为氧化铝工业产生的强碱性废渣——赤泥^[6,7],含有大量金属矿物质,可用来制备高效的混凝剂,强化混凝去除水中存在的胶体物质^[8]和重金属^[9];另一方面,赤泥也可用来制备高性能的吸附剂^[10],应用于地下水除砷^[11~13]、除氟^[14],污水除磷^[15]及有毒重金属的去除^[9].鉴于赤泥自身的化学组成和表面性质^[16,17],其具备潜在的催化臭氧氧化应用能力.本研究以酸改性为主要的活化手段,提高赤泥在多相催化臭氧氧化除污染体系中的催化活性,以硝基苯(nitrobenzene,NB)为目标污染物,考察酸化赤泥催化臭氧氧化除污染的效能,并对其作用机制进行初步探讨.

1 材料与方法

实验中所用溶液均由去离子水配制而成,包括 硝基苯在内的所有化学试剂,均为分析纯. 配制硝 基苯储备液浓度为 86.0 mg·L-1. 水中硝基苯浓度 分析采用高效液相色谱(HPLC, Waters 2695,美国 Waters 公司) 和 UV 检测器 (Waters 2998,美国 Waters 公司),色谱柱为 Waters Symmetry C18 (250 mm×4.6 mm, 5 μm, 美国 Waters 公司). 色谱条 件: 流 动 相 为 甲 醇: 水 (70:30), 流 速 1.0 mL·min⁻¹,柱温40℃,检测波长为254 nm. 酸活化 赤泥是以粉末状赤泥为载体,采用滴加硫酸的方法, 经过搅拌、老化、烘干等步骤一次制得. 具体步骤 为:①配制滴定所需酸性溶液(硫酸溶液),浓度为 0.5 mol·L⁻¹,并于室温存放;②将赤泥原矿适量于 烧杯中,用蒸馏水清洗后,于70℃的温度下烘干;③ 将清洗后的赤泥溶解于烧杯中,浓度约为10 g·L⁻¹; ④在磁力搅拌器的搅动下,逐滴缓慢滴加上述酸性 溶液,并用 pH 计监测溶液 pH 值变化,以 pH 6 ± 0.2 为滴定终点,并在磁力搅拌器搅动12 h,然后室温老 化 24 h; ⑤倾倒掉上清液,剩余悬浊液在 70℃下干 燥 12 h,得干燥粉末,并将干燥粉末研磨至细颗粒备 用;⑥将上述细颗粒放置于高温马弗炉中高温煅 烧.煅烧温度 600℃.煅烧时间 4 h.得干燥粉末: ⑦ 将上述干燥粉末研磨并过筛,选取粒径在0.075~ 0.15 mm 范围的颗粒备用.

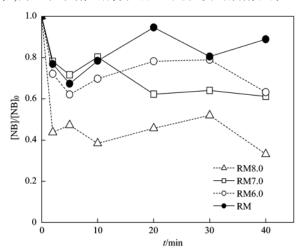
实验采用间歇反应,在一玻璃材质有效容积500 mL的圆柱反应器中进行.向该反应器中加入300 mL去离子水,通过控制氧气流量、臭氧发生器(3S-A5,北京同林科技有限公司)电压和通气时间调节水中溶解性臭氧质量浓度.停止通气后,迅速向反应器内加入一定体积的 NB 储备液(86.0

 $mg \cdot L^{-1}$)和一定质量的酸化赤泥催化剂. 开启磁力搅拌器,在不同时间间隔取样,用 $0.2~mL~Na_2SO_3$ (24 $mmol \cdot L^{-1}$)终止氧化反应. 样品经过 $0.45~\mu m$ 醋酸纤维膜过滤去除残余催化剂,待 HPLC 分析. 臭氧尾气用 KI 溶液吸收,水中溶解性臭氧浓度用靛蓝法[18]测定.

2 结果与讨论

2.1 酸化赤泥吸附水中硝基苯效能

采用硫酸为酸化剂,对赤泥原矿进行不同程度 的酸性活化. 酸化悬浊液终点分别为 6.0、7.0 和 8.0,分别记为 RM6.0、RM7.0 和 RM8.0. 图 1 所示 的是不同活化条件制备的酸化赤泥对 NB 的吸附去 除效能. 从中可以看出, 当向其中加入 500 mg·L⁻¹ 的赤泥原矿时,5 min 后吸附去除率最高,去除率为 32%; 当向其中加入500 mg·L-1的酸化赤泥时, NB 的去除效果发生了一些变化. 其中, RM8.0 的吸附 效能较好,在5 min 时 NB 的去除率达到 52%,40 min 后达到 65%; RM6.0 和 RM7.0 的吸附性能接 近,5 min 时 NB 的去除率分别为 38% 和 28%,40 min 后均不到 40%. 可以发现,酸化可以提高赤泥 自身对 NB 的吸附能力, 且随酸化程度有一定关系. 即酸化程度越高,吸附能力越弱. 虽然酸化赤泥对 NB 有一定的吸附效果,但无法满足高效去除的要 求,并且在吸附后期会出现一定程度的脱附现象.



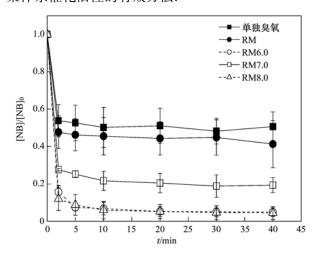
[catalyst] $_0 = 500 \text{ mg} \cdot \text{L}^{-1}$, [NB] $_0 = 0.4 \text{ mg} \cdot \text{L}^{-1}$, 溶液 pH = 7.0

图 1 酸化赤泥吸附水中硝基苯

Fig. 1 Removal of nitrobenzene through adsorption by acidified red mud

2.2 酸化赤泥催化臭氧氧化硝基苯效能

不同活化条件制备的酸化赤泥催化臭氧氧化 NB 的去除效能如图 2 所示. 从中可以看出,单独臭 氧氧化硝基苯的去除率较低,氧化 5 min 后硝基苯的去除率仅仅为 46%,氧化 40 min 时的去除率基本保持不变. 当向其中加入 500 mg·L⁻¹的赤泥原矿时,去除率略有提高,氧化 5 min 后去除率为 53%,氧化 40 min 时为 58%;当向其中加入 500 mg·L⁻¹的酸化赤泥时,硝基苯去除率明显提高,同时 NB 的氧化速率也显著加快. 其中,RM7.0 的催化性能较低,在 5 min 时 NB 的去除率达到 75%,40 min 后达到 79%,RM8.0 和 RM6.0 的催化性能接近,5 min 时的 NB 的去除率分别为 90% 和 92%,40 min 后为 94% 和 96%. 对比图 1 中酸化赤泥对 NB 的吸附能力,可以看出 RM6.0 催化臭氧氧化效果强于单独吸附和臭氧氧化之和,体现出一定的催化能力. 酸性活化是一种提高赤泥原矿在多相催化臭氧氧化除污染体系催化活性的有效方法.



 $\left[\begin{array}{c} {\rm O_3} \end{array} \right]_0 = 0.8 \ {\rm mg} \cdot {\rm L}^{-1}$, $\left[\begin{array}{c} {\rm catalyst} \end{array} \right]_0 = 500 \ {\rm mg} \cdot {\rm L}^{-1}$, $\left[\begin{array}{c} {\rm NB} \end{array} \right]_0 = 0.4 \ {\rm mg} \cdot {\rm L}^{-1}$, 溶液 pH = 7.0

图 2 酸化赤泥催化臭氧氧化水中硝基苯

Fig. 2 Removal of nitrobenzene through catalytic ozonation by acidified red mud

2.3 酸活化赤泥催化臭氧分解

图 3 表示了在没有 NB 存在的条件下,各种反应条件下溶液中臭氧浓度的变化情况. 对于单独臭氧过程,臭氧浓度的衰减主要由于其自身的分解导致[19]. 从图 3 中可以明显看出,臭氧自分解的能力比较弱,反应 20 min 时的分解率为 48%. 当催化剂加入到反应体系之中后,臭氧浓度的衰减主要以催化剂催化臭氧分解或表面吸附臭氧,都是提高臭氧利用效率和污染物去除效果的有效手段[20]. 从图 3 中可以看出,赤泥原矿的加入显著地加速了对水中臭氧浓度的衰减,20 min 时的衰减效率为 89%;当

加入500 mg·L⁻¹的酸化赤泥 RM6.0 时,臭氧衰减效率得到进一步提高,反应 20 min 时的臭氧衰减效率为92%. RM7.0 和 RM8.0 也可以强化水中臭氧的衰减,但是此时的酸性活化作用不明显. 上述研究结果说明,RM6.0 对水中臭氧的利用表现出了较高能力. 可以初步判断,RM6.0 在催化臭氧氧化降解NB 过程中表现出的高催化活性主要以促进臭氧分解或利用吸附臭氧为主要作用机制^[21]. 而 RM8.0表现出的高催化活性,则不是以提高对臭氧的利用效率为主.

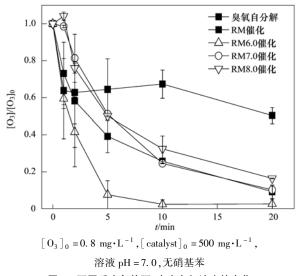


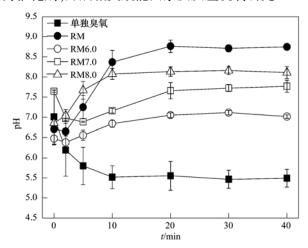
图 3 不同反应条件下,水中臭氧浓度的变化

Fig. 3 Variation of aqueous dissolved ozone under different reaction condition

2.4 酸化赤泥催化臭氧氧化降解硝基苯反应中溶液 pH 的变化

图 4 表示酸化赤泥催化氧化水中硝基苯过程中 溶液 pH 的变化. 单独臭氧氧化过程前 5 min 溶液 pH 逐渐降低,这主要是由于硝基苯被臭氧降解后, 产生一定量酸性中间产物而引起的[22]. 从图 4 中 可以看出,酸化赤泥的 pH 对其催化反应后的溶液 pH 变化,有着显著的影响. 赤泥原矿、酸改性赤泥 催化氧化的溶液 pH 均出现先降低后上升的现象. 其中,赤泥原矿催化臭氧氧化体系 pH 值升高幅度 最大. 这主要是由于赤泥自身为碱性材料,导致溶 液 pH 逐渐升高. 酸化赤泥催化臭氧氧化体系 pH 值升高幅度与其自身酸化终点 pH 密切相关. 酸化 赤泥pH终点越低,体系反应过程中pH变化越小. 此外,RM6.0的催化活性更强,生成的酸性中间产 物量较高,也是导致溶液 pH 变化幅度较小的另一 重要原因. 由此可见, RM6.0 催化反应过程中溶液 pH 变化较缓,且最终溶液 pH 在 7.0 左右,符合水

质要求,可用于实际水处理工艺当中. RM6.0 不仅具有较高的催化活性,而且其反应过程中溶液 pH 升高幅度较低,更为安全. 因此,后续研究以 RM6.0 为催化剂,开展相关效能因素及反应机制研究.

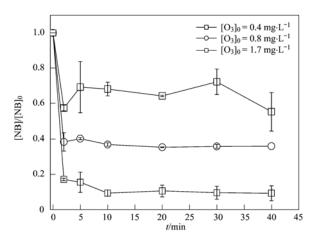


 $\left[\begin{array}{c} O_3 \end{array}\right]_0 = 0.8 \text{ mg} \cdot \text{L}^{-1}$, $\left[\begin{array}{c} \text{catalyst} \end{array}\right]_0 = 500 \text{ mg} \cdot \text{L}^{-1}$, $\left[\begin{array}{c} \text{NB} \end{array}\right]_0 = 0.4 \text{ mg} \cdot \text{L}^{-1}$

图 4 酸化赤泥催化氧化水中硝基苯过程中溶液 pH 的变化

Fig. 4 Variation of water pH during the reaction of NB catalytic ozonation by acidified red mud

2.5 臭氧投量对 RM6.0 催化臭氧氧化效能的影响 图 5 表示了在 RM6.0 投量 500 mg·L⁻¹情况下,臭氧浓度对 RM6.0 催化臭氧氧化 NB 效能的影响.可以看到,虽然加入了高效的催化剂 RM6.0,但过低浓度的臭氧导致对催化臭氧氧化 NB 的效能显著降低.催化剂需要臭氧的诱导,引发具有强氧化性的活性物种产生,从而提高对 NB 的氧化去除效果.因此,0.4 mg·L⁻¹的臭氧投量使得氧化5 min 时



[catalyst] $_0$ = 500 mg·L $^{-1}$, [NB] $_0$ = 0.7 mg·L $^{-1}$, 溶液 pH = 6.8 图 5 臭氧浓度对 RM6.0 催化臭氧氧化 NB 效能的影响

Fig. 5 Effect of ozone concentration on the removal efficiency of NB by catalytic ozonation using acidified red mud

NB 的去除率仅仅为 31%,反应 40 min 后的去除率为 45%,不足以高效去除水体中的 NB;而当臭氧浓度增加到 0.8 mg·L⁻¹时,RM6.0 催化臭氧氧化 NB 的去除率显著提高,氧化 5 min 时去除率达到 60%;当臭氧浓度继续提高至 1.7 mg·L⁻¹时,氧化 5 min 时 NB 的去除率达到 85%,40 min 后达到 92%,同时氧化速率大大提高.可得出结论,臭氧浓度显著地限制了 NB 的降解效果,较高浓度的氧化剂可以提供更多的反应元素,诱导 RM6.0 催化剂,实现对 NB 的高效降解.

2.6 硝基苯初始浓度对 RM6.0 催化臭氧氧化效能的影响

图 6 表示了不同硝基苯初始浓度对于 RM6.0 催化效能的影响.如图所示,当硝基苯浓度为 0.4 mg·L⁻¹时,氧化 5 min 时去除率就可以达到 92%,反应 40 min 后的去除率为 95%;当硝基苯浓度增加为 0.7 mg·L⁻¹时,氧化 5 min 和 40 min 的去除率仅仅为 40% 和 42%.可见,RM6.0 催化臭氧氧化水中 NB 的去除效果受硝基苯初始浓度的影响十分显著,针对于水体中低浓度的 NB,体系具有较高的催化活性.

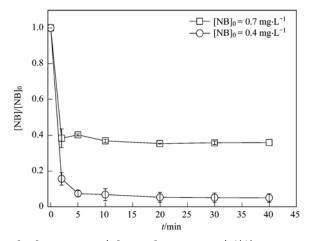


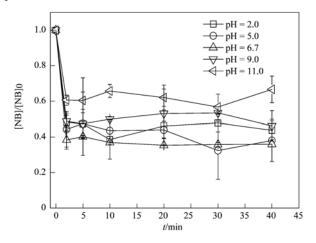
图 6 硝基苯初始浓度对于 RM6.0 催化效能的影响

Fig. 6 Effect of initial concentration on the removal efficiency of NB by catalytic ozonation using acidified red mud

2.7 溶液 pH 对 RM6.0 催化臭氧氧化效能及臭氧分解的影响

图 7 表示了溶液 pH 对 RM6. 0 催化臭氧氧化 NB 的影响. 从中可知,溶液 pH 对硝基苯的降解效率具有一定影响. 当溶液 pH = 2. 0 时,反应 5 min 时硝基苯的降解率为 52%,氧化 40 min 后为 54%;当溶液 pH = 5. 0 时,反应 5 min 和 40 min 的降解率分别为52%和 62%;当溶液 pH = 6. 7 时,NB 去除降解效果

最为理想,氧化5 min 和40 min 的降解率分别为59% 和65%; 当溶液 pH = 9.0 时, 降解效率开始下降, 反 应 5 min 和 40 min 的降解率分别 51% 和 52%; 当溶 液 pH = 11.0 时,降解效果最差,氧化5 min 和 40 min 的降解率分别为 40% 和 35%. 可以发现, 当溶液 pH 位于酸性及中性条件时,溶液 pH 的升高显著增加催 化剂的催化活性; 当溶液 pH 位于碱性范围时,溶液 pH 的升高,硝基苯的降解效能降低.



 $[O_3]_0 = 0.8 \text{ mg} \cdot L^{-1}, [\text{catalyst}]_0 = 500 \text{ mg} \cdot L^{-1},$ $[NB]_0 = 0.7 \text{ mg} \cdot L^{-1}$,

反应初始 pH 值采用浓度为 5% 的 HCl 或 NaOH 溶液进行调节

图 7 溶液 pH 对 RM6.0 催化臭氧氧化 NB 的影响

Fig. 7 Effect of water pH on the removal efficiency of NB degradation by acidified red mud

图 8 表示了溶液 pH 对臭氧分解的影响. 从中 可以看出,溶液 pH 对臭氧分解具有很强的影响. 当 溶液 pH = 2.0 时,5 min 和 20 min 的分解率分别为 48%和79%; 当溶液 pH = 5.0时, 臭氧5 min和20 min 的分解率分别为 58% 和 86%; 当溶液 pH = 7.0 时,催化臭氧分解效率最高,臭氧5 min 和20 min 的 分解率分别为 92% 和 99%; 当溶液 pH = 9.0 时, 臭 氧 5 min 和 20 min 的分解率分别为 75% 和 72%; 当溶液 pH = 11.0 时, 臭氧 5 min 和 20 min 的分解 率分别为85%和88%.蒸馏水中臭氧的分解机制 可用以下反应方程式表示[23]:

$$O_3 + OH^- \longrightarrow HO_2^- + O_2$$

$$k = 70 \text{ L} \cdot (\text{mol} \cdot \text{s})^{-1}$$
(1)

$$O_3 + HO_2^- \longrightarrow OH + O_2^{--} + O_2$$

 $k = 2.8 \times 10^6 \text{ L} \cdot (\text{mol} \cdot \text{s})^{-1}$ (2)

$$O_{3} + O_{2}^{-} \longrightarrow O_{3}^{-} + O_{2}$$

$$k = 1.6 \times 10^{9} \text{ L} \cdot (\text{mol} \cdot \text{s})^{-1}$$

$$O_{3}^{-} + \text{H}^{+} \xrightarrow{k_{+}} \text{HO}_{3}^{-}$$

$$(3)$$

$$k_{+} = 5.0 \times 10^{10} \text{ L} \cdot (\text{mol} \cdot \text{s})^{-1}$$

 $k_{-} = 3.3 \times 10^{2} \text{ L} \cdot (\text{mol} \cdot \text{s})^{-1}$
(4)

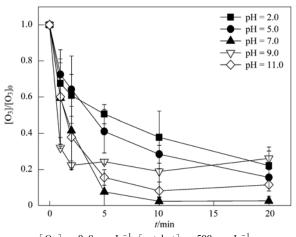
$$HO_3 \longrightarrow OH + O_2$$
 (5)

$$k = 1.4 \times 10^5 \,\mathrm{L} \cdot (\mathrm{mol} \cdot \mathrm{s})^{-1}$$
 (5)

$$\cdot \text{ OH } + \text{ O}_3 \longrightarrow \text{HO}_2^{\cdot} + \text{ O}_2$$

$$k = 1.0 \times 10^8 \sim 2.0 \times 10^9 \text{ L} \cdot (\text{ mol } \cdot \text{s})^{-1}$$

可见,OH-是臭氧链式分解的引发剂,HO;是 臭氧链式分解反应的中间物质,这就是 OH 可以启 动臭氧链式分解的原因. 溶液的 pH 值,表征了溶液 中OH-的浓度. 因此,pH值对臭氧分解及臭氧在水 中变化过程有显著影响. 溶液 pH 的升高(从 2.0~ 7.0)可以显著提高 RM6.0 催化臭氧分解效率; 当 溶液 pH 继续升高至碱性条件时,臭氧分解效率出 现一定程度的降低,溶液的碱性条件是有利于臭氧 的分解的. 当过多的 OH 存在于溶液中时,作为臭 氧的分解促进剂 OH-,也可以作为羟基自由基的猝 灭剂,进而终止臭氧分解. 溶液 pH 对 RM6.0 催化 剂催化臭氧分解能力的影响与溶液 pH 对其催化臭 氧氧化 NB 的影响表现出一致的结果. 这一实验结 果说明,在初始 pH 变化过程所带来的 RM6.0 催化 活性的变化,主要是由于体系中 OH-浓度变化,导 致臭氧分解形成羟基自由基所致[24];过高 pH 值导 致的羟基自由基的猝灭显促使 RM6.0 催化臭氧氧 化 NB 活性的降低.



 $[O_3]_0 = 0.8 \text{ mg} \cdot L^{-1}, [\text{catalyst}]_0 = 500 \text{ mg} \cdot L^{-1},$ $[NB]_0 = 0.7 \text{ mg} \cdot L^{-1}$,

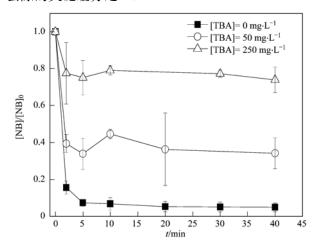
反应初始 pH 值采用 5% 的 HCl 或 NaOH 溶液进行调节 图 8 溶液 pH 对 RM6.0 催化臭氧分解的影响

Fig. 8 Effect of water pH on catalytic ozone decomposition by acidified red mud

2.8 叔丁醇对 RM6.0 催化臭氧氧化氧化效能及臭 氧分解的影响

自由基抑制剂叔丁醇(tert-butyl alcohol, TBA)

与羟基自由基(\cdot OH)的反应常数为 $k = 5.9 \times 10^8$ L·(mol·s)⁻¹,它与羟基自由基反应生成惰性中间 物质,终止臭氧分解链式反应. 因此,TBA 是一种常 用的自由基抑制剂[25]. 实验通过考察自由基抑制 剂对氧化过程的影响,以分析 RM6.0 催化臭氧氧化 NB 过程的机制. 从图 9 可以看到, TBA 的加入大大 降低了 RM6.0 催化臭氧氧化 NB 的催化活性. 加入 50 mg·L⁻¹ 和 250 mg·L⁻¹ 的 TBA 后,相比未加入 TBA, 反应 5 min 时, NB 的去除率分别降低了 28.3 和 72.8 个百分点,氧化 40 min 时分别降低了 28.7 和 72.3 个百分点, 且伴随着 TBA 浓度的增加, 催化 臭氧氧化反应的速率也呈现出下降的趋势. 可见, TBA 的加入,显著地抑制了 RM6.0 的催化活性,抑 制了 NB 的降解效率,说明羟基自由基被 TBA 猝灭 了,导致 NB 的去除效果降低. 实验现象间接证明, 反应过程中羟基自由基是存在的,是实现 NB 高效 去除的关键组分之一.



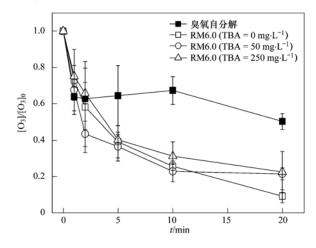
 $\left[\begin{array}{c} {\rm O_3} \end{array}\right]_0 = 0.8~{\rm mg}\cdot {\rm L}^{-1}$, $\left[\begin{array}{c} {\rm catalyst} \end{array}\right]_0 = 500~{\rm mg}\cdot {\rm L}^{-1}$, $\left[\begin{array}{c} {\rm NB} \end{array}\right]_0 = 0.4~{\rm mg}\cdot {\rm L}^{-1}$, 溶液 pH = 7.0

图 9 叔丁醇对 RM6.0 催化活性的抑制

Fig. 9 Inhibiting effect of TBA on the degradation of NB by acidified red mud

图 10 表示了 TBA 对 RM6.0 催化体系中臭氧浓度变化的影响. TBA 加入体系后,对臭氧浓度变化的影响极为微弱. 无论 TBA 浓度为何值,其对臭氧浓度变化的影响均不明显,且与未加 TBA 区别不大. 根据图 3 的研究结果,在 RM6.0 催化体系中,催化剂的加入加速了溶液中臭氧浓度的衰减,起到提高臭氧利用效率的作用. 结合图 10 的结果,间接证明了催化剂加速臭氧浓度的衰减,并不是由产生羟基自由基所致. 也就是说,在 RM6.0 催化体系中,催化剂对臭氧分解的贡献较低,而溶液

中臭氧浓度的衰减是由于催化剂 RM6.0 对臭氧的表面吸附导致的. 隋铭皓等^[26]和张华等^[27]的研究结果证明了臭氧在催化剂表面吸附,完成对臭氧分子的富集,进而实现对目标污染物的强化去除. 这也是继羟基自由基催化臭氧氧化机制之外,一种典型的多相催化臭氧氧化机制. 此外,RM6.0 催化臭氧降解 NB 过程中,产生一定的羟基自由基(图8),然而,羟基自由基的产生并不是由臭氧分解所致,极有可能是臭氧与硝基苯在界面氧化过程中分解形成.



 $\left[\begin{array}{c} {\rm O_3} \end{array} \right]_0 = 0.8 \ {\rm mg} \cdot {\rm L}^{-1} \, , \\ \left[\begin{array}{c} {\rm catalyst} \end{array} \right]_0 = 500 \ {\rm mg} \cdot {\rm L}^{-1} \, , \\ \\ \left[\begin{array}{c} {\rm NB} \end{array} \right]_0 = 0.4 \ {\rm mg} \cdot {\rm L}^{-1} \, , \\ \\ \end{array} \right.$

图 10 叔丁醇对臭氧分解的抑制作用

Fig. 10 Inhibiting effect of TBA on catalytic ozone decomposition by acidified red mud

3 结论

- (1) 酸化赤泥与赤泥原矿相比,表现出更为显著的催化能力,且 RM6.0 的催化性能最高,可实现较高活性的催化臭氧去除硝基苯,并且随着臭氧浓度增加,催化活性越来越显著.
- (2)溶液 pH 对 RM6.0 催化体系利用臭氧能力的影响与其催化臭氧氧化降解 NB 的影响表现出一致的结果,在初始 pH 变化过程所带来的 RM6.0 催化活性的变化,主要是由于体系中 OH 浓度变化,导致臭氧分解形成羟基自由基所致;过高 pH 值导致的羟基自由基的猝灭显促使 RM6.0 催化臭氧氧化 NB 活性的降低.
- (3) RM6.0 催化臭氧降解 NB 的主要作用机制是催化剂表面吸附臭氧,实现臭氧在催化剂表面的富集,进而实现对 NB 有机污染物的氧化降解. 羟基自由基极有可能是在臭氧与硝基苯在界面氧化过程中分解而成,进一步氧化 NB.

参考文献:

- [1] Ang E L, Zhao H M, Obbard J P. Recent advances in the bioremediation of persistent organic pollutants via biomolecular engineering[J]. Enzyme and Microbial Technology, 2005, 37 (5): 487-496.
- [2] Kasprzyk H B, Ziółek M, Nawrocki J. Catalytic ozonation and methods of enhancing molecular ozone reactions in water treatment[J]. Applied Catalysis B: Environmental, 2003, 46 (4): 639-669.
- [3] Kasprzyk-Hordern B, Raczyk-Stanisławiak U, Swietlik J, et al. Catalytic ozonation of natural organic matter on alumina [J]. Applied Catalysis B: Environmental, 2006, 62 (3-4): 345-358.
- [4] Burkholder J B, Talukdar R K. Temperature dependence of the ozone absorption spectrum over the wavelength range 410 to 760 nm[J]. Geophysical Research Letters, 1994, 21(7): 581-584.
- [5] Zhang T, Lu J F, Ma J, et al. Fluorescence spectroscopic characterization of DOM fractions isolated from a filtered river water after ozonation and catalytic ozonation [J]. Chemosphere, 2008, 71(5): 911-921.
- [6] 南相莉, 张廷安, 刘燕, 等. 我国主要赤泥种类及其对环境的影响[J]. 过程工程学报, 2009, **9**(S1): 459-464.
- [7] Gu H, Wang N, Liu S. Radiological restrictions of using red mud as building material additive [J]. Waste Management and Research, 30(9): 961-965.
- [8] Orešcanin V, Nad K, Valkovic V, et al. Red mud and waste base: raw materials for coagulant production [J]. Journal of Trace and Microprobe Techniques, 2001, 19(3): 419-428.
- [9] Santona L, Castaldi P, Melis P. Evaluation of the interaction mechanisms between red muds and heavy metals[J]. Journal of Hazardous Materials, 2006, 136(2): 324-329.
- [10] Altundoğan H S, Altundoğan S, Tümen F, et al. Arsenic removal from aqueous solutions by adsorption on red mud [J]. Waste Management, 2000, 20 (8): 761-767.
- [11] Genç-Fuhrmun H, Bregnhøj H, McConchie D. Arsenate removal from water using sand red mud columns [J]. Water Research, 2005, 39(13): 2944-2954.
- [12] Genç-Fuhrmun H, Tjell J C, McConchie D. Adsorption of arsenic from water using activated neutralized red mud [J]. Environmental Science and Technology, 2004, 38 (8): 2428-2434.

- [13] 张书武,刘昌俊,栾兆坤,等. 铁改性赤泥吸附剂的制备及 其除砷性能研究[J]. 环境科学学报,2007,27(12):1972-1977.
- [14] 郑雁,郑红,赵磊,等.赤泥除氟效果及吸附特性研究[J]. 有色矿冶,2008,24(5);38-41.
- [15] 陈程, 吴永贵, 钱晓莉, 等. 赤泥对含磷废水中磷的去除效果及其影响因素研究[J]. 环境科学与技术, 2011, **34**(6): 152-155.
- [16] Atun G, Hisarli G. A study of surface properties of red mud by potentiometric method [J]. Journal of Colloid and Interface Science, 2000, 228(1): 40-45.
- [17] 程雅靖,单保庆,张洪,等. 赤泥在控制沉积物磷释放中的应用研究[J]. 环境工程学报,2009,3(7):1180-1184.
- [18] Bader H, Hoigné J. Determination of ozone in water by the indigo method [J]. Water Research, 1981, 15(4): 449-456.
- [19] Qi F, Chen Z L, Xu B B, et al. Influence of surface texture and acid-base properties on ozone decomposition catalyzed by aluminum (hydroxyl) oxides [J]. Applied Catalysis B: Environmental, 2008, 84(3-4): 684-690.
- [20] Jans U, Hoigné J. Activated carbon and carbon black catalyzed transformation of aqueous ozone into OH-radicals [J]. Ozone Science and Engineering, 1998, 20(1): 67-90.
- [21] 马军, 张涛, 陈忠林, 等. 水中羟基氧化铁催化臭氧分解和氧化痕量硝基苯的机理探讨[J]. 环境科学, 2005, **26**(2): 78-82.
- [22] Yang Y X, Ma J, Qin Q D, et al. Degradation of nitrobenzene by nano-TiO₂ catalyzed ozonation [J]. Journal of Molecular Catalysis A-Chemical, 2007, **267**(1-2): 41-48.
- [23] Von Gunten U. Ozonation of drinking water; Part I. Oxidation kinetics and product formation [J]. Water Research, 2003, 37 (7): 1443-1467.
- [24] Bing J, Li L, Lan B, et al. Synthesis of cerium-doped MCM-41 for ozonation of p-chlorobenzoic acid in aqueous solution [J]. Applied Catalysis B: Environmental, 2012, 115-116: 16-24.
- [25] 谭桂霞, 陈烨璞, 徐晓萍, 等. 臭氧在气态和水溶液中的分解规律[J]. 上海大学学报(自然科学版), 2005, 5(11): 510-512.
- [26] 隋铭皓,马军,盛力.吸附在多相催化臭氧氧化降解有机物中的作用[J].中国给水排水,2006,23(22):99-102.
- [27] 张华,石锐,臧兴杰,等. CuO- Ru/Al_2O_3 催化臭氧化降解苯乙酮的研究[J]. 环境科学, 2010, 3(31): 715-719.

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Algicidal Activity Against Red-tide Algaes by Marine Bacterial Strain N3 Isolated from a HABs Area, Southern China SHI Rong-jun, HUANG Hong-hui, QI Zhan-hui, et al. (1920) Isolation, Identification and Oxidizing Characterization of an Iron-Sulfur Oxidizing Bacterium LYO1 from Acid Mine Drainage		
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