

热能工程

微生物烟气脱硫工艺中硫化物生物氧化与回收单质硫的研究

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摘要:

碱吸收-微生物烟气脱硫是一类经济有效并应用较广泛的SO2脱除技术,可分为SO2碱吸收,厌氧还原与好氧化3部分,该文着重考察了好氧化部分。在有效容积为45 L的内循环生物流化床内,以含硫化物的厌氧段出水作为进水,利用无色硫细菌氧化硫化物为单质硫。经28 d的运行,有机物负荷和S2-负荷分别达3.73 kgCOD/(m3×d)和1.09 kgS2-/(m3×d),相应的脱除率可达78%和90%以上,最大SO产率为75%左右。生物学显微镜照片和X射线衍射(X-ray diffractometer, XRD)分析显示出水富含硫颗粒和膜状硫。考察了水力停留时间和曝气量对其处理效果的影响,结果表明,在进水S2-浓度和有机物浓度分别为200和800 mg/L时,适宜水力停留时间为8 h,最佳曝气量为60~90 L/h。

关键词: 微生物烟气脱硫 无色硫细菌 单质硫 硫化物 生物氧化

Study on the Sulfide Biological Oxidation and Recycle Elementary Sulfur in Biological Flue Gas Desulphurization Process

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Abstract:

Absorption-biological flue gas desulphurization process is a cost-effective and widely applied SO2 removal technology. It is can be divided into SO2-absorption, anaerobic reduction and aerobic oxidation, and the third zone was focused in this article. The biological oxidation process of sulfide to sulfur with colorless sulfur bacteria was studied in an internal circulating bio-fluidized bed reactor (effective volume=45L) with the sulfide effluent from anaerobic zone as the influent. After 28 days of operation, the organic loading rate reached over 3.73 kgCOD/(m3×d) and 1.09 kgS2-/(m3×d) for the sulfide loading rate. The removal efficiency of organic and sulfide were more than 70% and 85% respectively while the maximum yield of sulfur was 75% approximately. Moreover, the microscopic photographs and X-ray diffraction analysis showed that there were sulfur granules and membranaceous sulfur in effluent water. In addition, two efficiency factors including hydraulic remain time and the air aeration quantity were inspected. The investigation demonstrated that the optimum hydraulic remain time was 8h under the influent concentration of S2- and organic respectively for 200 mg/L and 800 mg/L, and the best treatment effect of aeration was obtained at 60~90 L/h.

Keywords: biological flue gas desulphurization colorless sulfur bacteria elementary sulfur sulfide biological oxidation

收稿日期 2010-12-16 修回日期 2011-02-09 网络版发布日期 2011-11-24

DOI:

基金项目:

江苏省高校科研成果产业化推进项目(JH07-008)。

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