Analysis of infrared optical polishing effluents and reduction of COD and TSS levels by ultrafiltration and coagulation/flocculation

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ABSTRACT
Samples of polishing effluent produced during infrared optics manufacture were analyzed. Their particle size, composition, Zeta potential, chemical oxygen demand (COD), total suspended solids (TSS), and settleable solids were determined. Feasibility of treatment methods such as ultrafiltration (UF) and coagulation/flocculation was investigated to reduce both COD and TSS. It was found that effluents consisted of a suspension of micro- and nanoparticles. Effluent particle size distribution reflected the removal rate of the originating polishing process. Their composition was primarily germanium and other polished substrates as well as polishing abrasives. The effluent Zeta potential was highly negative and prevented particle settling. COD of all specimens was very high, which prevented sewage discharge. Laboratory-scale trials using UF showed substantial COD abatement of up to 74.1%. TSS was reduced to zero after UF. Comparable coagulation/flocculation COD abatement was demonstrated for the highest COD sample.

Keywords: Polishing effluents; Industrial; Wastewater treatment; Analysis; Industry; Effluent

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