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Grey water treatment using a solar powered electro-coagulator and vacuum membrane distillation system

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ABSTRACT

Grey water reuse has been identified as a sustainable solution to reduce the pressure on freshwater storages. Membrane distillation techniques provide high quality permeate from this insanitary source. However, grey water contains surfactants present in the form of linear alkylbenzene sulphonate (LAS) that reduces the contact angle between the feed solution and the membrane surface leads to the wetting phenomenon. Electro-coagulation (EC) with aluminium electrodes has been demonstrated as an effective technology that removes LAS significantly. The aim of this paper is to investigate the effect of the current density and circulation rate of EC unit on the permeate water quality. For this purpose, synthetic grey water was treated at different operating conditions. It has been shown that, only after 12 min of EC, the turbidity, total suspended solids, chemical oxygen demand, total organic carbon, total nitrogen, total phosphorous, electrical conductivity and faecal coliforms were reduced by an average 94.4%, 89.9%, 83.8%, 71.0%, 73.1%, 96.1%, 30.2% and 1.32log, respectively. The EC permeate was sent to the solar powered vacuum membrane distillation (VMD) to produce pure water. Photovoltaic panels and a thermal collector supplied electricity and heat, respectively, for the combination of EC and VMD in order to use renewable energy.

Keywords: Grey water treatment; Vacuum membrane distillation; Electro-coagulation; Solar energy; Membrane wetting

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