



## Modification of polyamide membrane surface with chlorine dioxide solutions of differing pH

Erewari Alayemieka<sup>a,b</sup>, SeockHeon Lee<sup>b,\*</sup>

<sup>a</sup>Department of Construction and Environment Engineering, University of Science and Technology, Deajeon, 113 Gwahangno, Yuseong-gu, Deajeon, Republic of Korea

<sup>b</sup>Water Resource Center, Korea Institute of Science and Technology, Hwarangno 14-gil 5, Seongbuk-gu, Seoul 136-791, Republic of Korea

Tel. +82 2 958 6644; Fax: +82 2 958 5839; email: seocklee@kist.re.kr

Received 8 August 2011; Accepted 13 November 2011

---

### ABSTRACT

Free chlorine is the common biocide used in the membrane desalination industry. However, it is incompatible with polyamide membranes. Chlorine dioxide ( $\text{ClO}_2$ ) is an effective biocide and is more compatible with polyamide membranes. The effects of  $\text{ClO}_2$  on polyamide membrane hydrophilicity and surface charge were studied under static soaking conditions. Membrane coupons were soaked in acidic, neutral, and alkaline pHs of  $\text{ClO}_2$ . The membrane's hydrophilicity and surface charge were assessed by dynamic contact angle and streaming potential analyzer respectively, while performance was analyzed on a bench scale desalination system. The result of the experiment showed that  $\text{ClO}_2$  influenced membrane hydrophilicity and surface charge. Hydrophilicity improved irrespective of  $\text{ClO}_2$  pH, whereas surface charge was either suppressed or improved depending on  $\text{ClO}_2$  pH. Permeate flux increased for acidic, neutral, and alkaline conditions by 34%, 34%, and 77%, respectively. A slight trade-off in salt leakage for acidic and alkaline pH conditions was observed. The phenomenal performance of  $\text{ClO}_2$  oxidized membrane was influenced by modifications in both the membrane surface and chemical characteristics.

*Keywords:* Polyamide membrane; Oxidation; Chlorine dioxide pH; Surface properties modification; Membrane selectivity; Membrane permeate

---

\*Corresponding author.