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EFFECT OF TEMPERATURE ON SODIUM OXALATE SOLUBILITY

INTRODUCTION

The solubility of sodium oxalate in basic solution at 20°C is strongly dependent on total sodium ion concentration.[1] Because of the limited solubility in solutions with high sodium concentration, solid sodium oxalate could recycle to the main sludge slurry stream in the DWPF with solids from gravity settling and filtration if the $[C_2O_4^=]$ exceeds the solubility limit. Because process streams in the DWPF will be at a minimum of 38°C,[2] tests have been completed to establish how oxalate solubility changes as the temperature is increased for a series of solutions representing the expected range of $[Na^+]$ in the DWPF.

SUMMARY AND CONCLUSIONS

At any selected $[Na^+]$, ∿20% more sodium oxalate can be dissolved at 35°C than at 20°C; ∿40% more can be dissolved at 49°C than at 20°C. At any selected temperature, an increase in $[Na^+]$ markedly reduces the solubility of oxalate. Based on the present DWPF flowsheet conditions (maximum $[Na^+]$ ∿ 5M; minimum temperature ∿ 38°C), up to 10.9 lbs/hr of $Na_2C_2O_4$ can be tolerated without recycling solid sodium oxalate to the sludge stream. The present flowsheet shows an average of 2.4 lbs/hr $Na_2C_2O_4$ entering the DWPF using the overall waste composition as described in the TDS. Recycling of $Na_2C_2O_4$ will not be a problem in the DWPF for the waste that has been analyzed to date. Analyses on a tank-by-tank basis is continuing to establish if $[Na_2C_2O_4]$ in a specific tank is beyond the level that can be tolerated.

EXPERIMENTAL DETAILS

Oxalate concentration was measured at 20°C, 35°C, and 49°C in a series of solutions containing NaOH and $NaNO_3$. Excess sodium oxalate powder was added to these solutions and the mixtures were shaken overnight at a selected temperature

using a constant temperature bath equipped with a shaker tray. Undissolved sodium oxalate was allowed to settle and the concentration of dissolved oxalate in the solution was determined by titration with standard permanganate. Figure 1 shows the effect of temperature at constant $[Na^+]$ on oxalate solubility. Conversely, figure 2 shows the effect of $[Na^+]$ on oxalate solubility at constant temperature.

JRF:ln

REFERENCES

1. J. R. Wiley to M. L. Hyder. *Sodium Oxalate Solubility in Simulated SRP Waste Solutions.* DPST-78-480 (8/23/78).

2. L. F. Landon, compiler. *Preliminary Technical Data Summary No. 2 for the Defense-Waste Processing Facility.* DPSTD-77-13-2, June, 1979.

FIGURE 1

EFFECT OF TEMPERATURE ON
OXALATE SOLUBILITY AT VARIOUS SODIUM ION CONCENTRATIONS

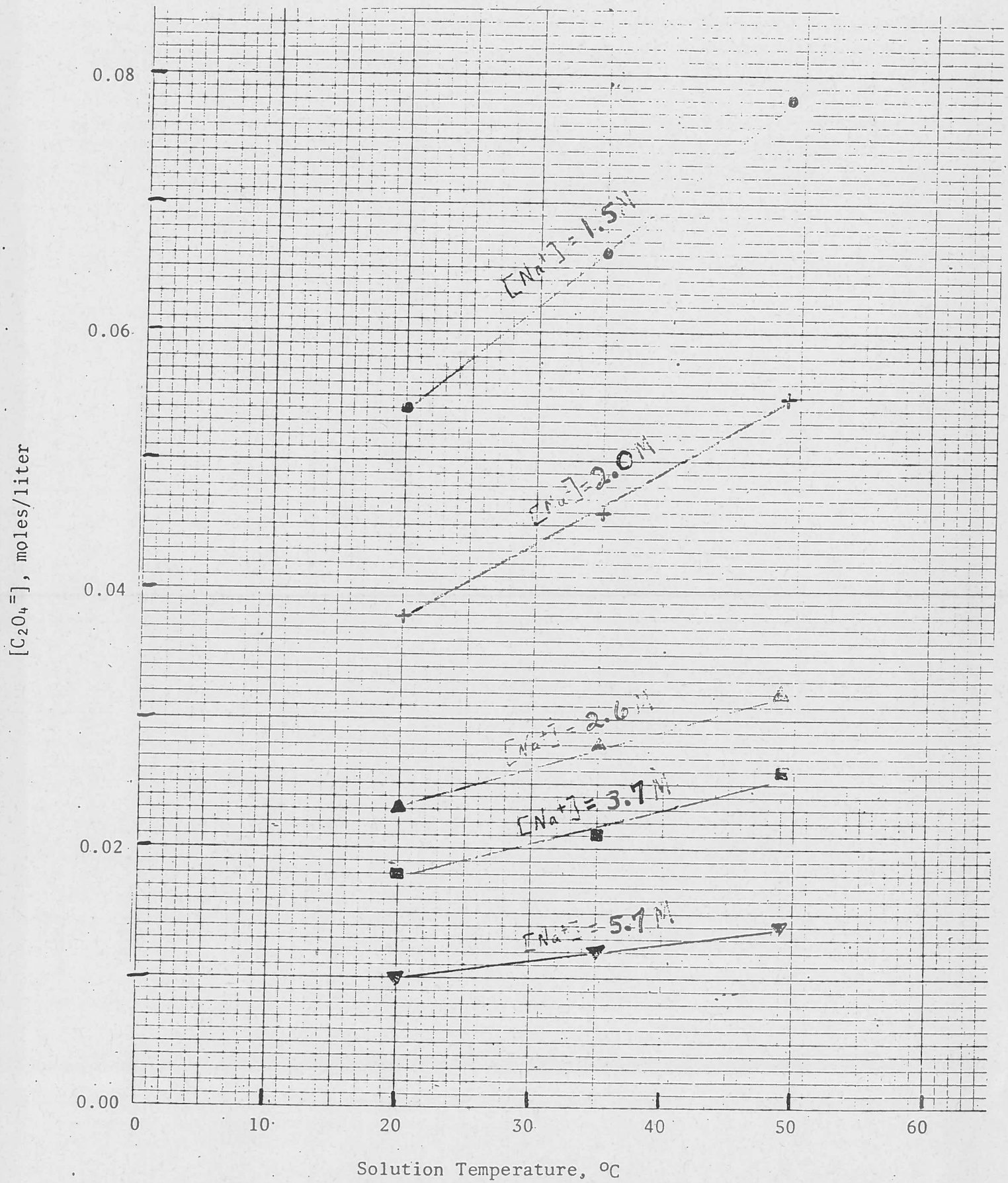

FIGURE 2

EFFECT OF SODIUM ION CONCENTRATION
ON OXALATE SOLUBILITY AT VARIOUS TEMPERATURES