



## FILMTEC Membranes

### Water Chemistry and Pretreatment: Barium Sulphate Scale Prevention

#### Barium Sulphate Scale Prevention

Barium sulfate is the most insoluble of all alkaline-earth sulfates. When present in water, it may lead to massive precipitation, possibly acting as a catalyst for calcium sulfate and strontium sulfate scaling.

In most natural waters, barium is present at a level that would cause barium sulfate precipitation in the concentrate stream. The critical feed concentration of barium may be as low as < 15 µg/L in seawaters, < 5 µg/L in brackish waters or even < 2 µg/L if sulfuric acid is dosed to brackish waters.

#### Calculation <sup>18</sup>

Prediction of BaSO<sub>4</sub> scaling potential is performed in the same way as the previously described procedure for CaSO<sub>4</sub>.

1. Calculate the ionic strength of the concentrate stream ( $I_c$ ) following the procedure described in [Scaling Calculation General \(Section 2.4.1\)](#):

$$I_c = I_f \left( \frac{1}{1-Y} \right) \quad \text{Eq. 5}$$

2. Calculate the ion product ( $IP_c$ ) for BaSO<sub>4</sub> in the concentrate stream:

$$IP_c = \left[ (mBa^{2+})_f \left( \frac{1}{1-Y} \right) \right] \left[ (mSO_4^{2-})_f \left( \frac{1}{1-Y} \right) \right]$$

where:

$$(mBa^{2+})_f = M Ba^{2+} \text{ in feed, mol/L}$$

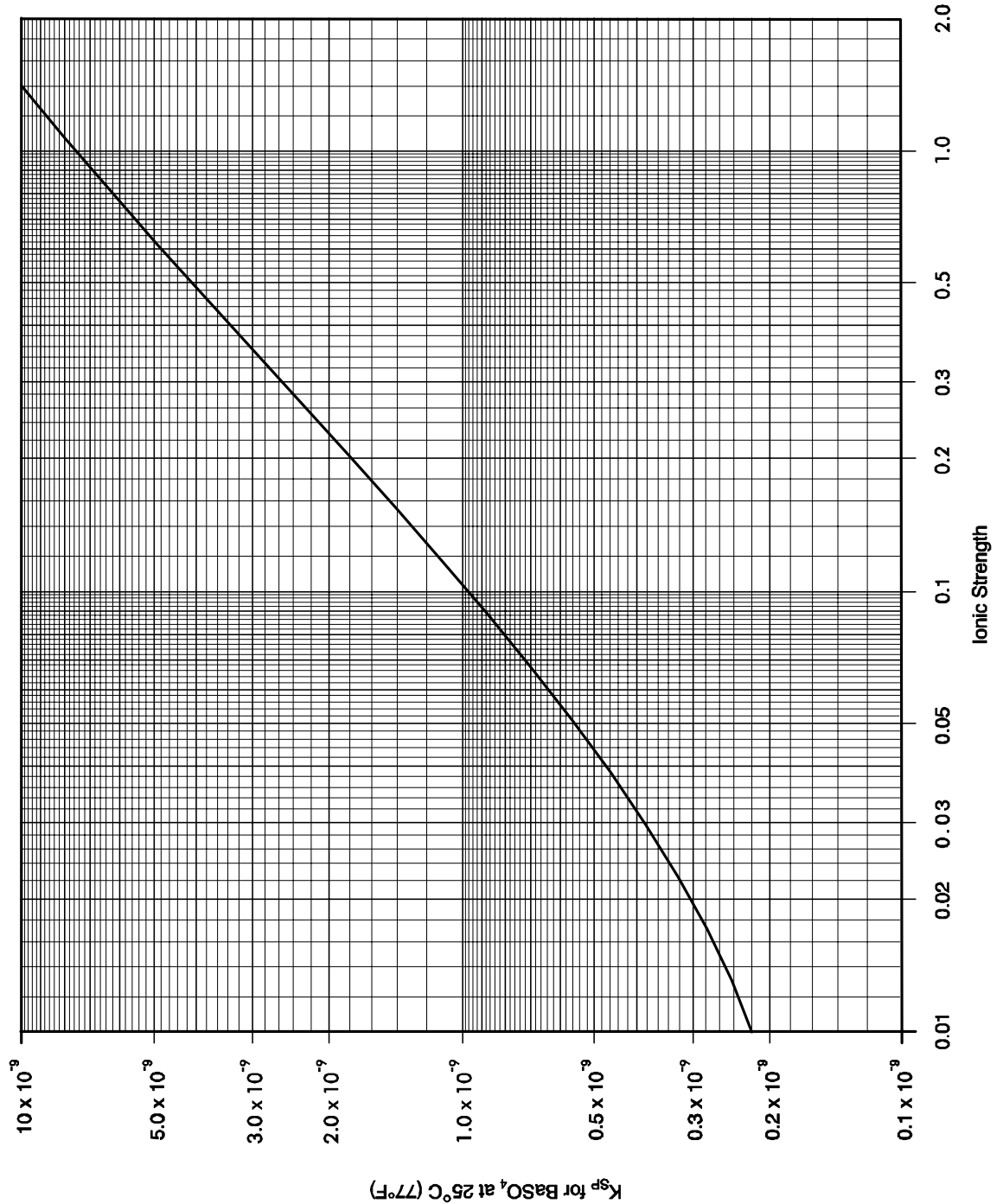
$$(mSO_4^{2-})_f = M SO_4^{2-} \text{ in feed, mol/L}$$

3. Compare  $IP_c$  for BaSO<sub>4</sub> with the solubility product ( $K_{sp}$ ) of BaSO<sub>4</sub> at the ionic strength of the concentrate stream, Figure 2.7. If  $IP_c \geq K_{sp}$ , BaSO<sub>4</sub> scaling can occur, and adjustment is required.

#### Adjustments for BaSO<sub>4</sub> Scale Control

- The adjustments discussed in [Calcium Sulfate Scale Prevention \(Section 2.4.3\)](#) for CaSO<sub>4</sub> scale control apply as well for BaSO<sub>4</sub> scale control.

Figure 2.7  $K_{sp}$  for  $BaSO_4$  versus ionic strength / 10



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