

# Fluoride Ion

ELIT 8221 · ELIT Ion Selective Electrode · Anion

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## PHYSICAL SPECIFICATIONS

Body Length	130 mm (excl. contact) / 140 mm (incl.)
Body Diameter	8 mm
DC Resistance (25°C)	< 2.5 MOhm
Min. Sample Volume	5 ml

## ELECTRODE SPECIFICATIONS

Electrode Model	ELIT 8221
Ion	Fluoride (F <sup>-</sup> )
Ion Type	Anion
Valence	1
Membrane Type	Solid-state mono-crystalline membrane
Molar Mass	18.998 g/mol
1000 ppm equiv.	0.053 M

## OPERATIONAL PARAMETERS

Preconditioning	1000 ppm Fluoride standard
Preconditioning Time	Min. 5 minutes
Detection Range	0.02 to 1,900 ppm ( $1 \times 10^{-6}$ to 0.1 M)
Electrode Slope	$54 \pm 5$ mV/decade
pH Range	pH 4 to 8
Temperature Range	0 to 80 °C
Response Time	< 10 seconds (90% response)
Potential Drift	< 3 mV/day in 1000 ppm (8 hours)

## SELECTIVITY COEFFICIENTS (INTERFERENCE DATA)

Interfering Ion	Selectivity Coeff.	Note
Hydroxyl (OH <sup>-</sup> )	~0.1	Eliminated by keeping pH below 8. TISAB also functions as a de-complexing agent to release fluoride bound in complex ions.

SC = approximate apparent increase in measured concentration caused by 1 unit of interferent. Error% = ((interferent conc × SC) / target conc) × 100.

## REAGENTS & STANDARDS

Reference Electrode	Single junction silver chloride (ELIT 001n).
ISAB / Buffer	TISAB (Total Ionic Strength Adjustment Buffer) — 1:1 v/v. Preparation: dissolve 57 ml acetic acid + 45 g NaCl + 4 g CDTA in 500 ml distilled water. Adjust pH to 5.5 with 5M NaOH, then make to 1 litre.
Standard Prep	Dissolve 2.210 g anhydrous sodium fluoride (NaF) in 1 litre deionised water.

## TYPICAL APPLICATIONS

- Drinking Water Analysis
- Environmental Monitoring
- Food Analysis
- Agriculture
- Industrial Process Control

## CALIBRATION & SAMPLE PREPARATION

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Calibrate with 1000, 100, 10, 1, 0.1 ppm F solutions. For samples with ionic strength > 0.01 M, pH outside 4–8, or fluoride in complex ions: mix all standards and samples 1:1 with TISAB before measurement.

Low ionic strength, pH 4–8: no preparation needed. High ionic strength or pH outside range: mix 25 ml sample with 25 ml TISAB.

## SPECIAL ANALYTICAL PROCEDURES

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### Fluoride in Plant Material

Use the Standard Addition method. Dry plant material at 80 °C for 24 hours, grind, weigh 2 g into 150 ml plastic beaker. Add 100 ml 0.1M perchloric acid, stir for 20 mins. All calibration solutions must be mixed 50/50 with TISAB before measuring.

### Fluoride in Toothpaste

Same procedure as plant material but disperse in pure water. Choose sample weight to give 10–100 ppm F in solution. If solution exceeds 100 ppm F, use the Sample Addition method. Maximum solution concentration for this electrode is ~2000 ppm.

## ANALYTICAL NOTES

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- Note the relatively narrow pH range (4 to 8) — the key operational constraint for the fluoride electrode.
- TISAB serves a dual purpose: equalising ionic strengths AND de-complexing fluoride from bound forms.
- For field measurements, electrodes can be immersed directly in natural water bodies if pH and ionic strength are suitable.

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