Verification of Benzethonium Chloride Titrant Standardization for the Assay of Sodium Lauryl Sulfate in accordance with EP 11

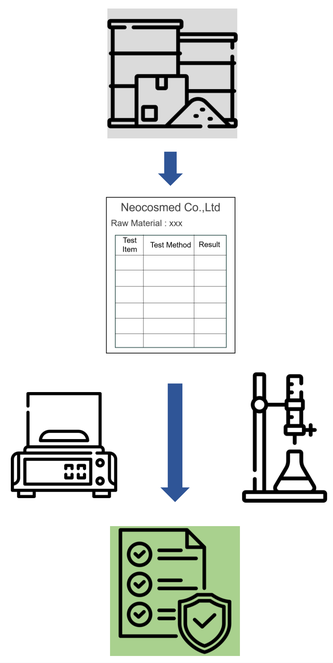
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Abstract

As part of the revision of the analytical documentation for the raw material sodium lauryl sulfate (SLS), a key ingredient in toothpaste formulations, in accordance with the European Pharmacopoeia Version 11 (EP 11), the procedure for standardizing the benzethonium chloride solution used in the Assay section has been modified. Therefore, a method verification study was conducted to ensure the accuracy, reliability, and practical applicability of the new procedure. The objective was to validate the preparation and standardization method of 0.004 M benzethonium chloride solution and to update the assay documentation for SLS to align with the revised pharmacopoeial standard. The benzethonium chloride solution was prepared and standardized, resulting in an actual concentration of 0.0038 M. It was then applied in the assay testing of SLS raw materials A and B. For raw material A, the average %Assay from three replicates was 94.04%, meeting the acceptance criterion of ≥ 85%. For raw material B, the average %Assay from three replicates was 95.60%, meeting the acceptance criterion of ≥ 92%. These results confirm that the new standardization method for 0.004 M benzethonium chloride solution is accurate and suitable for use, and the assay documentation for SLS has been updated accordingly to comply with the EP 11.

Introduction

The Raw Material Department, under Quality Control, ensures all ingredients meet Certificate of Analysis (COA) or customer specifications by following test procedures referenced from pharmacopoeia standards. Since these standards are updated annually, all inspection documents must be revised accordingly. Recently, per EP 11 guidelines for sodium lauryl sulfate (SLS) assay, the standardization of benzethonium chloride has shifted from using an SLS standard to 0.1 M perchloric acid. Consequently, a study and testing according to the updated method are required to confirm the correct procedure and ensure its practical applicability for the Raw Material Testing Laboratory of the Quality Control Department.

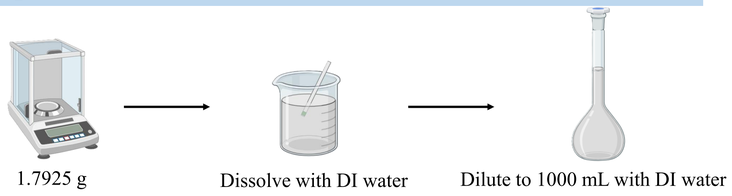


Objectives

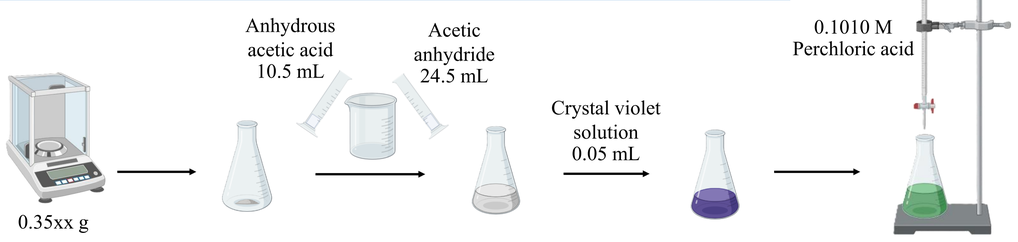
1. To validate the applicability of the standardization method for 0.004 M benzethonium chloride solution, as referenced in the European Pharmacopoeia (EP) Version 11.
2. To revise the sodium lauryl sulfate (SLS) raw material inspection supporting document for the assay test, ensuring compliance with the European Pharmacopoeia (EP) Version 11.

Experiments

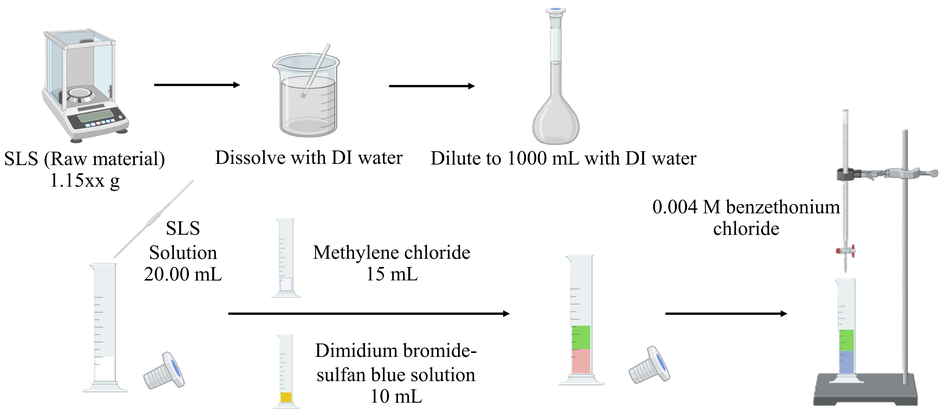
1. Preparation of 0.004 M benzethonium chloride solution



2. Standardization of 0.004 M benzethonium chloride solution



3. Assay test for sodium lauryl sulfate (Raw material A and B)



Results

Table 1. Standardization of 0.004 M benzethonium chloride solution

Flask	Benzethonium chloride (g)	Volume of perchloric acid (mL)		
		Initial	Final	Used
A. benzethonium chloride	0.3501	0.00	8.60	8.60
B. blank	-	33.00	34.20	1.20
Volume of perchloric acid				7.40

•Calculation of the actual concentration of benzethonium chloride from the preparation

$$C = \frac{N \times 44.81 \times V \times W_1}{0.1 \times 1000 \times W_2 \times 448.1}$$

$$C = \frac{0.1010 \times 44.81 \times 7.40 \times 1.7925}{0.1 \times 1000 \times 0.3501 \times 448.1}$$

$$= 0.0038 \text{ M}$$

Table 2. Titration of sodium lauryl sulfate solution (Material A, 1.1510 g) with 0.0038 M benzethonium chloride

Flask	Volume of SLS A (ml)	Volume of 0.004 M benzethonium chloride (ml)			Assay (%)
		Initial	Final	Used	
A	20.00	0.00	18.00	18.00	93.95
B	20.00	18.00	36.05	18.05	94.21
C	20.00	0.00	18.00	18.00	93.95
Average Assay (%)					94.04

$$\% \text{ Assay} = \frac{V \times N \times 288.4 \times 1.0963 \times 1000}{W \times 10 \times A}$$

Acceptance criteria ≥ 85 %

Table 3. Titration of sodium lauryl sulfate solution (Material B, 1.1520 g) with 0.0038 M benzethonium chloride

Flask	Volume of SLS B (ml)	Volume of 0.004 M benzethonium chloride (ml)			Assay (%)
		Initial	Final	Used	
A	20.00	0.00	18.30	18.30	95.43
B	20.00	18.30	36.70	18.40	95.95
C	20.00	0.00	18.30	18.30	95.43
Average Assay (%)					95.60

$$\% \text{ Assay} = \frac{V \times N \times 288.4 \times 1.0963 \times 1000}{W \times 10 \times A}$$

Acceptance criteria ≥ 92 %

Conclusions

The standardization of the 0.004 M benzethonium chloride solution, referenced in European Pharmacopoeia (EP) Version 11 and used for the assay of sodium lauryl sulfate (Materials A and B), yielded results that met the defined acceptance criteria. Therefore, the applicability of the 0.004 M benzethonium chloride standardization method is confirmed. Consequently, the raw material inspection supporting document for sodium lauryl sulfate has been revised to update the assay procedure from the previous method to align with EP Version 11.

Acknowledgement

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References

[1] Cui, L., Puerto, M., López-Salinas, J. L., Biswal, S. L. & Hirasaki, G. J. Improved methylene blue two-phase titration method for determining cationic surfactant concentration in high-salinity brine. Anal Chem 86, 11055–11061 (2014).
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