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HLB Value and Surfactant-Blend Evaluation

Experiment 4 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To calculate a suitable HLB value and evaluate a series of surfactant blends.

Principle

Hydrophilic-lipophilic balance describes relative affinity for water and oil within a stated system. Griffin's mass expression applies to suitable non-ionic surfactants; it is not a universal formula for every surfactant. A blend's HLB is approximated by a mass-weighted average.

Requirements

- Assigned surfactants with supplier HLB data, selected oil and identical teaching emulsion compositions.
- Balance, mixing setup, containers and the laboratory stability-observation method.

Procedure

1. Identify approach

For an appropriate non-ionic molecule with known hydrophilic mass M_h and total molar mass M, calculate HLB = 20 M_h/M. Otherwise use the applicable method or supplier value.

2. Plan blends

For surfactants A and B, HLBblend = fA HLBA + (1-fA) HLBB. Keep total surfactant mass and oil/water composition constant.

3. Prepare series

Weigh several blends covering the assigned HLB range and prepare emulsions by one controlled mixing method.

4. Observe

Record emulsion type, appearance, creaming and separation at stated times. A conductivity/dilution test can help assess emulsion type.

5. Compare

Identify the most suitable blend for the chosen oil and test conditions. This estimates that system's required HLB rather than a new intrinsic HLB for an unknown ingredient.

6. Report

List actual component values, fraction calculation, composition and observation interval. Do not equate a short-term appearance with validated shelf life.

Observations and Record

Blend HLB	A / B masses	Emulsion type / stability record
_____	_____	_____
_____	_____	_____
_____	_____	_____

Worked Example

The numbers below are illustrative; enter your own observations in the record.

- If M_h = 300 and M = 600 g/mol for a suitable non-ionic surfactant, Griffin HLB = 10.0.
- Using assigned Tween 80 HLB 15.0 and Span 80 HLB 4.3, target HLB 10.0 requires fTween = (10.0-4.3)/(15.0-4.3) = 0.5327.
- For a 1.000 g blend, use 0.5327 g Tween 80 and 0.4673 g Span 80, subject to the actual supplier data.

Result

Record the observed outcome and calculated value, with units. State whether the stated laboratory specification was met; do not copy the worked example as your result.

Precautions

- Use the instructor's assigned material and apparatus; record actual temperature and units with every measured property.
- Check instrument calibration and use repeat readings rather than a single convenient result.
- Compare a marketed teaching formulation only under the same method and conditions; its excipients can change the property.

Viva Questions and Answers

1. What does required HLB refer to?

The HLB range that best emulsifies a particular oil system under defined conditions.

2. Does the blend equation use mass or volume fraction?

Mass fraction.

3. Can the Griffin expression be applied blindly to ionic surfactants?

No. Its applicability must be checked.

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