

## AS/NZS 2009

### Appendix I

#### *Becke Line method – background and approach for improved traceability*

During the review process for an application for accreditation for determining the refractive index (RI) of glass beads using the Becke Line method, it was apparent that the metrological traceability of the implementation of the method in accredited facilities needed improvement.

ISO/IEC 17025 has several concepts that are expected to be considered as part of every clause, regardless of whether they are stated explicitly in each clause. These are Impartiality, Confidentiality, Risk and Continuous Improvement.

The matter in question here is related to risk and continuous improvement.

The Becke Line test for refractive index is a semi-quantitative test that is explicitly stated in the scope of *Appendix I Determination of Refractive Index of Glass Beads in AS/NZS 2009 Glass beads for pavement-marking materials*, as ‘a quick procedure to give a preliminary check on the beads’. The Rainbow method is described as ‘an accurate reference method’. No facility is accredited for the reference method, and the reference method is never performed to confirm the indicative result from the Becke Line test.

In terms of metrological traceability, NATA’s guidance material (Appendix A, General Accreditation Criteria: Metrological Traceability Policy) states that the purpose of the testing is part of the consideration when assessing the need for traceability of a particular component of a method. It is generally understood that a screening method will have less stringent criteria applied.

NATA expects that ISO/IEC 17025 accredited facilities performing any testing will continuously improve their performance. The traceability network supporting the Becke Line method leans heavily on the reference material (the liquid of known refractive index) since it is the only component of the method that propagates metrological traceability.

Unlike most screening tests, the Becke Line result often stands alone. No facility has sought accreditation for the definitive test (Rainbow). Since the Rainbow test will never be used to confirm the Becke Line result, the traceability of the Becke Line needs to be more than would otherwise be expected of a simple preliminary check.

In Appendix I clause I4.2 (e), the RI is determined simply as “at least” 1.5.

The method suggests that more than one liquid of known RI should be used (by use of the plural in clause I3.1 (c)). For the significant figures used to report the result as “at least 1.5”, provided that the liquid selected is confirmed to have an RI above 1.5, one liquid is acceptable.

Note that the liquids identified in Appendix I are examples only, and other liquids may be used.

The liquid of known RI that the facility chooses to use must have sufficient assurance of metrological traceability that users of the report can have confidence in the outcome.

Since the RI is likely to be affected by factors such as the purity of the liquid and storage conditions (e.g., exposure to heat/humidity), there must be a system of checks to ensure that the RI is still within the stated value.

No statement of metrological traceability is associated with most certificates of analysis for Analytical Reagent (AR) liquids. Facilities using such liquids will need to take measures to establish traceability themselves.

Such measures could include, but are not limited to:

- Testing of the liquid to determine the RI by an accredited testing facility;
- Using a Certified Reference Material (CRM) with a defined RI within the required range;
- Checking the RI in-house with a refractometer.

As of 12 December 2022, testing facilities accredited to determine the refractive index of organic solvents include:

- Intertek Testing Services (Australia) Pty Ltd  
Dean Ambler  
(02) 93166544  
[Dean.Ambler@Intertek.com](mailto:Dean.Ambler@Intertek.com)
- Independent Petroleum Laboratory Ltd (NZ)  
Anthony Hockings  
+64 09 432-8567  
[www.ipl.co.nz](http://www.ipl.co.nz)

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