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Evaluation of Spot Tests for Detecting Lignin

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When conducting basic preservation workshops, there is a need to recommend a spot test for the determination of lignin in paper. TAPPI Test Method T401, "Fiber Analysis of Paper and Paperboard," describes two spot tests for the detection of lignin: the phloroglucinol and aniline sulfate tests. The standard states that the aniline sulfate stain is less sensitive than phloroglucinol. To compare their sensitivity, we performed both tests on a variety of papers.

Nine types of Australian recycled paper, white, pink and yellow copy paper, paper towel, archive text, manila board, coated paper and newsprint were tested. In all cases except one, the two tests showed the same results. The one exception was an 80% recycled paper. In this case, the phloroglucinol test indicated lignin was present whereas the aniline sulfate test did not.

Five handsheets of known groundwood content (5%, 10%, 15%, 20% and 30%) and four handsheets of known lignin content (0.24%, 1.47%, 4.4% and 7.45%) were tested. Both stains indicated that lignin was present above 4.4% lignin and 5% groundwood. Neither stain detected lignin in the handsheets containing 0.24% or 1.47% lignin. For both stains, the intensity of the colored spot reflected the lignin or groundwood content of the paper.

A number of samples of old yellowed paper were also tested. It was thought that the yellow color of the aniline sulfate stain might not have been detectable on the yellow paper. Both stains reacted similarly; on the only paper for which the aniline sulphate test was inconclusive, the phloroglucinol stain was also inconclusive.

Phloroglucinol solution is light-sensitive and deteriorates quickly. Aniline sulfate is cheaper (currently aniline sulfate costs \$0.12 per gram and phloroglucinol costs \$1.40 per gram in

Australian dollars), and the stain is easier to prepare than the phloroglucinol stain. Aniline sulfate stain also has the advantage of having water as solvent rather than the acid/alcohol mix of phloroglucinol.

This comparison indicates that aniline sulfate is of similar sensitivity to the phloroglucinol stain in detecting lignin in paper. As it is cheaper, easier to prepare, and the chemicals used to prepare it are easier to obtain, it is reasonable to recommend the use of the aniline sulfate stain in preference to phloroglucinol. This recommendation is particularly relevant for small overseas countries where obtaining chemicals may be difficult.



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