

results and discussion

Before the acid wash steps were added to the iron test procedure, the chemical tests were applied to 70 field samples of insulating and building materials collected during many different surveys. To verify the presence or absence of asbestos, these samples were analyzed by TEM. The results of the spot tests confirmed by TEM are presented in Table I.

The number of samples that gave positive reactions to the test and that were confirmed by TEM are listed under "true positive." Samples with negative responses to the test and that TEM confirmed as not containing asbestos are listed under "true negative." The number of samples falling under "false negative" indicates the unreliability of the spot tests.

As shown in Table I, two samples gave false negative results for the magnesium (chrysotile) test. These samples contained amosite with 5% to 15% chrysotile. Both samples gave positive reactions to the iron (amosite and crocidolite) test. Thus, even though the magnesium test was negative, these samples were correctly identified as containing iron (∴ possible presence of amosite or crocidolite - subsequently confirmed by TEM). With the use of the Mg Reagent, the blue color was bleached when equal amounts of chrysotile and amosite were tested. With three times higher concentration of amosite, the blue color of the chrysotile was completely bleached. The presence of chrysotile does not, however, affect the iron test for amosite or crocidolite. Table I lists the overall results from various types of samples. The presence or absence of asbestos ("true positive" and "true negative") was correctly identified by the test in 52 of 70 samples. Eighteen samples gave false positive reactions. The test was 100% accurate in having no false negative reactions.

Of the 10 "false positives" for magnesium, 5 were talc samples, 4 contained mineral wool, and 1 was a ceiling tile. The eight "false positives" for the iron test were the samples that contained mineral wool. These samples were tested before adding the Acid Wash steps to the procedure, and thus the number of false positives would be considerably less if the samples were re-tested by the complete procedure that includes the acid wash steps.

The chemical test without the acid wash was also applied to 104 acoustical plaster and ceiling tile samples from New York City and Indiana schools. These samples were analyzed by X-ray diffraction or dispersion staining before submission for the chemical test. The chemical test results, verified by X-ray diffraction and dispersion staining, are also tabulated in Table I.

From these 104 ceiling tiles, the test without the acid wash steps correctly indicated the presence or absence of asbestos in 74 samples. If these 74 samples, 25 were "true positives" and 49 were "true negatives." Thirty samples gave false positive reactions. The false positive reactions occurred because of other magnesium and iron compounds present in 3 samples. Since glycerine treatment removes soluble magnesium, iron, and plaster, the insoluble compounds interfere with the test by giving false positive reactions. The test was 100% correct in identifying samples that contained

more than 1% asbestos, which is the EPA lower limit for asbestos in bulk material.

After adding the acid wash steps to the iron test, 13 field samples were tested by the complete procedure. The results of the chemical test were confirmed by TEM, and are presented in Table I. The presence or absence of asbestos was correctly indicated without any false results.

The complete chemical test was applied in an asbestos survey conducted at the Lewis Research Center of the National Aeronautics and Space Administration (NASA). Various samples were collected from building materials, such as ceiling tile, ceiling and pipe insulation, concrete, and plaster. The results of the chemical test were compared against the results of dispersion staining, and presented in Table I. Of the 28 samples, 5 were also analyzed by transmission electron microscope for confirmation of both results. No false positive or negative result was obtained.

summary and recommendations

For the 174 samples tested without the acid wash steps, the test correctly indicated that 126 contained or did not contain asbestos. Forty-eight samples that did not contain asbestos were indicated as containing asbestos, and no samples containing asbestos were indicated as not containing asbestos.

With the addition of the acid wash steps to the procedure, the false positive results were eliminated for the building material samples. For a total of 41 samples, the chemical test correctly indicated that all 41 samples contained or did not contain asbestos. No false positives were obtained, and non-asbestos samples were indicated as not containing asbestos.

The magnesium and iron chemical tests can screen samples of bulk materials quickly and simply for the possible presence or definite absence of asbestos. Thus industrial hygienists can use this field method for determining the presence or absence of asbestos material quickly before conducting an environmental survey, particularly for screening asbestos in the materials used for soundproofing and fireproofing in schools, office buildings, etc.

This test is recommended for screening use in determining compliance with the EPA lower limit of 1% asbestos in bulk material and in any situations where a quick screening test is needed to determine the presence of asbestos in bulk material to preclude unnecessary expensive laboratory testing for asbestos.

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references

1. Caution: *Asbestos Dust*. A scriptographic booklet by Channing L. Bete Co., Inc., Greenfield, MA. Prepared in