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NOTE

Determination of Contents of Seven Heavy Metals in Chalk

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The contents of seven heavy metals *i.e.*, Cu, Pb, Hg, Cd, As, Mn and Cr in chalks were analyzed by ICP-MS. Correlation coefficients of detected elements range from 0.990-0.9999, limits of detection range from 0.08-0.56 µg/L and relative standard deviations range from 0.98-3.66 % for all elements. Results show that the heavy metal content of chalks is lower than road dusts, concentrations of Cu, Pb, Hg, Cd, As, Mn and Cr are 1.661, 0.649, 1.290, 0.043, 3.105, 11.775 and 0.819 µg/g, respectively. The data suggested that heavy metal pollution is not the main factor for chalk, but respiratory hazards should be paid more attention for teachers using chalk.

Key Words: Heavy metals, Chalk, ICP-MS.

Chalks were main tool for teaching before. Although the more multimedia is used, the less chalk is used, but now some teacher using it to teach, especially in some poor schools. Chalk is made of gypsum and usually contains many other minerals, such as heavy metals, so most people has being worry about harm from chalk dust, such as heavy metals in chalk dust[1]. Due to the limits of conditions, the concentration of heavy metals in chalks has not been detected systematically, but many researchers still have much doubt what harm chalk dust has.

There are several methods for determining many elements simultaneously, such as ICP-AES[2] and ICP-MS[3]. Compared with other methods, ICP-MS has high accuracy and precision. In this study, seven heavy metals *i.e.*, Cu, Pb, Hg, Cd, As, Mn and Cr in chalks were determined by ICP-MS method.

Chalks were collected in classroom of China Agricultural University, Beijing. The ICP-MS instrument was the PQ Excell instrument (ELAN DRCII, PE Company, USA).

Method: Sample preparation and instrument parameters were referred to Zhang's method[4].

Correlation coefficients of detected elements range from 0.990-0.9999, limits of detection range from 0.08-0.56 µg/L and relative standard deviations range from 0.98-3.66 % for all elements (Table-1). These results show that this method for detecting these seven heavy metals simultaneously is accurate and precise.

The results showed that chalks contain many kinds of heavy metals, such as Cu, Pb, Hg, Cd, As, Mn and Cr. But all these heavy metals range from 0.043-11.775 µg/g, which is much lower than road dusts[5] (Table-2).

TABLE-1
CORRELATION COEFFICIENT, LIMITS OF DETECTION AND RELATIVE STANDARD DEVIATIONS OF DETECTED ELEMENTS

Heavy metals	Correlation coefficient	Limits of detection (µg/L)	Relative standard deviations (%)
Cu	0.9999	0.26	2.75
Pb	0.9999	0.14	1.84
Hg	0.9996	0.37	3.66
Cd	0.9999	0.09	0.98
As	0.9990	0.56	2.08
Mn	0.9997	0.09	1.33
Cr	0.9998	0.08	1.89

TABLE-2
CONCENTRATION OF SEVEN KINDS OF HEAVY METALS IN CHALK DUST

Elements	Content (µg/g)	Elements	Content (µg/g)
Cu	1.661	As	3.105
Pb	0.649	Mn	11.775
Hg	1.290	Cr	0.819
Cd	0.043	–	–

Conclusion

Chalk dust contains low level of heavy metals, which is not the main factor for chalk. Respiratory hazards should still be paid more attention for teachers using chalk, we advice teachers to teach by multimedia which can avoid harm from chalk dust.

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