Australian Standard™

Coal and coke—Analysis and testing

Part 17: Higher rank coal—Moisture-holding capacity (equilibrium moisture)

Standards Australia

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Australasian Institute of Mining and Metallurgy

Australian Coal Association

Australian Coal Preparation Society

Australian Institute of Energy

Bureau of Steel Manufacturers of Australia

Coalfield Geology Council of N.S.W.

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PREFACE

This Standard was prepared by the Standards Australia Committee MN/1, Coal and Coke, as a revision of AS 1038.17—1989, *Methods for the analysis and testing of coal and coke*, Part 17: *Determination of moisture-holding capacity (equilibrium moisture) of higher rank coal.*

Major differences from the previous edition are as follows:

(a) Inclusion of a Foreword outlining the history of the development of the test method.

(b) Inclusion of notes referring to difficulties in applying the Standard to coals containing significant quantities of free-swelling clays.

CONTENTS

FOREWORD

The moisture-holding capacity, (MHC), or equilibrium moisture procedure, was originally developed as a means of estimating the 'true' bed moisture of coal and was later adopted by ASTM (1936)[1] for use in classifying Northern American coals by rank.

The history of the development of the test has been described by Rees et al (1939)[2] and Edwards (1968)[3]. These developments were as follows.

(a) The first equilibration procedure devised by Stansfield and Gilbart (circa 1907) involved the exposure of crushed coal in shallow trays in a box, which also held trays containing a solution of calcium chloride of 1.3 S (50% relative humidity). The coal was weighed from time to time until a maximum weight was recorded. The method could be prolonged, in some cases up to 6 weeks, and was abandoned in 1910.

(b) In a second method devised by Stansfield and Gilbart (circa 1923), crushed coal was equilibrated in a rapid stream of air at 60% relative humidity. By this method, practical equilibration was achieved within 48 hours. In 1931 the method was improved by inclusion of temperature control at 30°C. In the same year Stansfield and Gilbart developed a vacuum-desiccator procedure for equilibration at constant temperature over a range of selected relative humidity conditions. The moisture content of the equilibrated samples was determined by the usual method of drying at 105°C. Results were then extrapolated to 100% relative humidity; the so-called 'true' equilibration moisture.

(c) Kreulen (circa 1951) modified the procedure by treating the coal with water, the surplus being removed by filtration before the sample was brought into equilibrium with the atmosphere of prescribed humidity.

(d) Over subsequent years, the notion of true equilibrium moisture became disused and was subsequently replaced by 'equilibrium moisture-holding capacity in an atmosphere of 96% r.h. at 30°C'.

The current Australian Standard method is technically equivalent to BS 1016: Part 21/ISO 1018[4] which were based primarily on the work of Edwards (1968)[3]. Test variables such as: samples preparation, size of dishes, test portion mass, equilibration time, dish lids on or off during equilibration, and the time interval for reintroducing the equilibrated samples to atmospheric pressure, were evaluated by Edwards at that time.

A comparison between the AS, BS/ISO and the ASTM D1412[5] methods is given in the table below.

	AS 1038	**BS 1016/ ISO 1018**	**ASTM D1412**
Applicability	Higher rank coal	Hard coal	All coals
General	Reduced pressure equilibration	Atmospheric or reduced pressure equilibration	Reduced pressure equilibration
Coal topside	212 μm nominal topsize	212 μm nominal topsize	1.18 mm (16 mesh) nominal topsize
Sample pretreatment	20 g wetted coal is filtered then pressed between filter pads	20 g wetted coal is filtered then pressed between filter pads	20–25 g wetted coal is filtered only