Australian Standard™

Coal preparation

Part 2.2: Higher rank coal—Froth flotation—Sequential procedure

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The following interests are represented on Committee MN/1:

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 New South Wales

CSIRO, Division of Energy Technology

Department of Mines and Energy, Queensland

Electricity Supply Association of Australia

Institution of Engineers, Australia

Minerals Council of Australia

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University of New South Wales

University of Queensland

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PREFACE

This Standard was prepared by the Standards Australia Committee MN/1, Coal and Coke to supersede AS 4156.2.2—1994. It should be read in conjunction with AS 4156.2.1, *Coal preparation* Part 2.1: *Higher rank coal—Froth flotation—Basic test* which contains the basic test.

The objective of this Standard is to provide those conducting coal exploration programs with a comprehensive procedure that will allow a complete determination of the flotation characteristics of a coal.

The term 'informative' has been used in this Standard to define the application of the appendices to which it applies. An 'informative' appendix is for information and guidance only.

CONTENTS

FOREWORD

AS 4156.2.1 specifies apparatus, conditions and procedures for the preliminary assessment of the floatability of fine coals, and suggests a suitable form for the presentation of results. The procedure in AS 4156.2.1 gives only a semi-quantitative indication of the results that may be obtained in a practical industrial flotation process. It is recognized that flotation conditions may be changed in practice and scavenging or further cleaning stages employed to optimize product yield and quality. This Standard describes a procedure for the more complete determination of the flotation characteristics of a coal, using the apparatus and basic procedures described in AS 4156.2.1. The purpose of this extended procedure is to provide information similar to that provided by the sink/float curve, which is the basis for density separations. The data obtained are expressed as a yield-ash curve. The information can be used to define the limitations on the cleaning of coal by froth flotation.

Similar data may be obtained by other procedures*, but comparative test work has shown the recommended procedure to be the more generally applicable.

The procedures specified in this Standard are of practical significance in the development and evaluation of coal preparation plant flotation circuits, although engineering design aspects, such as flotation kinetics and the selection of size and type of cell, are not addressed.

The flotation response curve (yield-ash curve) indicates the maximum possible yield at any specified ash level.

The procedure may be modified to test and compare the performance of different frother and collector types, the assessment of liberation by grinding, and the comparison of alternative feed size ranges. However, results of such tests should clearly indicate use of a non-standard procedure.

The general shape of the curve indicates the sensitivity of flotation performance to the nature of the coal and to operating condition. By using the alternative Mayer curve presentation for the test results, it is also possible to provide an indication of instantaneous ash at any point and of ash levels of secondary (middlings) products. Such information may be of significance in overall plant maximization and control.

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* DELL, C.C. An improved release analysis procedure for determining coal washability. *J. Inst. of Fuel*, 1964, *37*: 149-50.

CAVALLARO, J.A. and DEURBROUCK, A.W. Froth flotation washability data of various Appalachian coals using a timed release analysis technique. 1965 *U.S. Bureau of Mines RI* - 6652.

PRATEN, S.J., BENSLEY, C.N. AND NICOL, S.K. An evaluation of the flotation response of coals.

Int. J. of Miner. Process, 1989, 27: 243-262.

STANDARDS AUSTRALIA

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1 SCOPE This Standard sets out a laboratory sequential procedure for the froth flotation testing of fine coal, e.g. coal having a particle size of less than 0.5 mm. The procedure provides a means of evaluating for a coal the flotation characteristics (expressed as a yield-ash relationship) that may be expected from the froth flotation process.

Pulp samples that cannot be dewatered without the use of heat or chemical additives are not covered by this Standard; nor does it cover procedures for the investigation of flotation kinetics.

The test is not intended to provide plant design data.

This Standard should be read in conjunction with AS 4156.2.1.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS
1038 Coal and coke—Analysis and testing
1038.3 Part 3: Proximate analysis of higher rank coal

2096 Classification and coding systems for Australian coals

2418 Coal and coke—Glossary of terms

3881 Higher rank coal—Size analysis

4156 Coal preparation
4156.1 Part 1: Higher rank coal—Float and sink testing
4156.2.1 Part 2.1: Higher rank coal—Froth flotation—Basic test

4264 Coal and coke—Sampling
4264.1 Part 1: Higher rank coal—Sampling procedures

3 DEFINITIONS For the purpose of this Standard, the definitions given in AS 2418 and AS 4156.2.1, and that below, apply.

3.1 Higher rank coal (as defined in AS 2096)—coal having a gross specific energy of 21.00 MJ/kg or greater on an ash-free, moist (afm) basis *and* 27.00 MJ/kg or greater on a dry, ash-free (daf) basis.

4 PRINCIPLE A sequence of laboratory flotation tests is carried out on a single coal sample, using a procedure based on that described in AS 4156.2.1. Variations on that procedure are made to generate a number of products, by re-floating concentrates and tailings a number of times. The masses and ash percentages of the various products are used to construct a yield-ash curve showing the flotation response.