International Journal of Coal Geology 133 (2014) 72–99

Contents lists available at ScienceDirect

International Journal of Coal Geology

journal homepage: www.elsevier.com/locate/ijcoalgeo

Review article

Coal fires in China over the last decade: A comprehensive review

Zeyang Song [a,b,*], Claudia Kuenzer [b]

[a] Faculty of Resources and Safety Engineering, China University of Mining and Technology (Beijing), Beijing 100083, PR China
[b] Earth Observation Center, EOC, German Aerospace Center, DLR, Oberpfaffenhofen, 82234 Wessling, Germany

ARTICLE INFO

Article history:
Received 15 July 2014
Received in revised form 4 September 2014
Accepted 4 September 2014
Available online 18 September 2014

Keywords:
Coal fire
China
Geophysical detection
Greenhouse gas
Trace element
Grout and gel injections

ABSTRACT

Coal fires pose great threats to valuable energy resources, the environment, and human health and safety. They occur in numerous countries in the world. It is well-known that China, the largest coal producer and user globally, is one of the countries that have badly suffered from coal fires. Thus, over the course of the last decade, a lot of local research studies on coal fires in China have been published in international and Chinese scientific journals. The goal of this paper is to set the scene on past and current coal fire research in China. In this review we explore multidisciplinary investigations undertaken during the last decade associated with coal fires in China including fire detection, modeling, the assessment of environmental and human health impacts as well as fire-fighting engineering. We outline a systematic framework of research on coal fires and address inter-relations of sub-topics within this systematic framework. Additionally, the scientific and technical studies and their advantages, shortcomings and challenges for coal mine administrations are discussed. It is hoped that this comprehensive overview provides scientific guidance for management and coordination of coal fire projects.

Contents

* Corresponding author at: Faculty of Resources and Safety Engineering, China University of Mining and Technology (Beijing), Beijing 100083, PR China.
E-mail addresses: szycumtb@126.com (Z. Song), claudia.kuenzer@dlr.de (C. Kuenzer).

http://dx.doi.org/10.1016/j.coal.2014.09.004
0166-5162/

1. Introduction

Coal fires occur most frequently in exposed or underground coal seams (Kuenzer and Stracher, 2012). They are often triggered via spontaneous combustion of coal, which is an exothermic oxidation reaction between coal and air. Coal temperature will increase if heat released by coal oxidation is not sufficiently dissipated. When the temperature reaches a critical temperature (80–130 °C), the coal will start to smolder and burn (Taraba and Michalec, 2011; Yuan and Smith, 2008; Zhang and Kuenzer, 2007; Zhu et al., 2013). A large number of factors influence

Fig. 1. Coal fires and their hazards in the Wuda Coalfield, Inner Mongolia Autonomous Region. (a) Burning coal; (b) a coal dust explosion triggered by a coal fire when the bulldozer move the burning coal; (c) pungent gas and smoke emitting from an underground coal fire; (d) a crack induced by a coal fire. Its width and temperature are approximately 40 cm and 177.8 °C, respectively.
Photos by Zeyang Song (2014).