

and elements contained in clay species. The discovery of inorganic nitrogen matter in bituminous coal implies that  $\text{NH}_4$ -bearing illite is not necessarily a parameter uniquely related to the absolute age of coalification.

**97/05173 Impact of low-rank coal properties on advanced power systems**

Benson, S. A. and Sondreal, E. A. *Proc. Annu. Int. Pittsburgh Coal Conf.*, 1996, 13, (1), 484-498.

The paper gives details of advanced coal-fired combined-cycle power systems under development and demonstration with the potential to increase generating efficiency to 50%, reduce electricity costs by up to 20%, and meet stringent standards on emissions of  $\text{SO}_x$ ,  $\text{NO}_x$ , fine particulates, and air toxic metals. Integrated gasification combined cycle, pressurized fluidized-bed combustion, and extremely fired combined cycle system rely on different high-temperature combinations of heat exchange, gas filtration, and sulfur capture to meet these requirements. The success of these systems when operated on low-rank coals depends largely on ash behaviour.

**97/05174 The importance of heterogeneous decomposition reaction for the emission levels of NO and  $\text{N}_2\text{O}$  during fluidized bed combustion of coal**

Boavida, D. *et al.* *Proc. Annu. Int. Pittsburgh Coal Conf.*, 1996, 13, (1), 371-376.

The TGA technique was used to investigate the effects of temperature and type of char on the heterogeneous reduction of both NO and  $\text{N}_2\text{O}$  on char surfaces. The kinetic parameters for the decomposition of both NO and  $\text{N}_2\text{O}$  on the char surfaces was obtained and correlated with the previous results from the combustion of coals and of the same chars in a laboratory fluidized bed combustor.

**97/05175 Incombustible-reducing apparatus for coal ashes and fluidized-bed cooling apparatus for ashes after combustion**

Yokomichi, Y. and Morisaki, H. *Jpn. Kokai Tokkyo Koho JP 09,178,356* [97,178,356] (Cl. F27B15/16), 11 Jul 1997, Appl. 95/350,396, 21 Dec 1995, 7 pp. (In Japanese)

The title apparatus is described. The ashes obtained can be used as mixing material for cement.

**97/05176 Industrial implementation of oxidative catalytic removal of hydrogen sulfide and hydrogen cyanide from coke-oven gas. 3. Recovery of ammonium thiocyanate from working gas-cleaning solutions**

Nazarov, V. G. *et al.* *Koks Khim.*, 1997, (5), 24-28. (In Russian)

The production of a standard quality ammonium thiocyanate from the coke-oven gas cleaning solutions from the absorbers using the polysulfide and catalytic sulphophthalocyanine methods is described. An aqueous solution of Et alcohol was used to dissolve the thiocyanate, with the subsequent removal of the sulfate through filtration, recovery of ethanol through distillation, and crystallization of the cyanate from its aqueous solution. Findings from industrial scale tests indicated that with the existing equipment, the product which meets the quality standard can be obtained with the yield of <30-40%, with additional treatment using barium hydroxide. The paper also addresses the economical aspects of this process.

**97/05177 Kinetic analysis of slurry phase Fischer-Tropsch synthesis**

Fujimoto, K. *et al.* *Stud. Surf. Sci. Catal.*, 1997, 107, (Natural Gas Conversion IV), 181-186.

Using a stirred reactor and supported cobalt catalysts, Fischer-Tropsch synthesis was conducted in the slurry phase. Under well stirred conditions, neither the mass transfer between the gas-solid interface nor the liquid-solid interface was the rate limiting step in the reaction sequence. The catalytic activity and product selectivity were markedly affected by the particle size for small pore catalyst while those of a large pore catalyst were not affected by the particle where the partial diameter is larger than 0.1 mm. The phenomena were well simulated by theoretical calculations.

**97/05178 Kinetic interpretation of thermoanalytical profiles of coals and model compounds**

Van den Rul, H. *et al.* *DGMK Tagungsber.*, 1997, 9702, (Proceedings ICCS '97, Volume 1), 441-445.

AP-TPR (atmospheric pressure temperature programmed reduction) can be used in the analysis of solid substances like coals to specify their different sulfur forms. A kinetic analysis of AP-TPR data results in a better understanding of the conversion mechanism of the investigated substance, leading to an accurate interpretation of its AP-TPR profile. Thermoanalytical techniques like AP-TPR or TGA (thermogravimetric analysis), unlike other kinetic measurement methods, measure an overall physical property that contains information about an unknown amount of elementary reactions whose separate contributions cannot be determined. The isoconversional kinetic analysis method takes this fact into account by considering thermal analysis processes as multi-step reactions. Based on the results of this method, it is possible to distinguish between different complex processes like reversible or consecutive reactions. The isoconversional and other methods as applied to A.P-TPR and TGA data are discussed. Examples of kinetic analyses resulting in the interpretation of the AP-TPR profile are shown for model compounds and coals.

**97/05179 Limit of equivalence ratio on mixing enhancement near the tube exit in a tone excited rich flame**

Kim, J. K. and Shin, H. I. *Int. J. Energy Res.*, 1997, 21, (4), 377-383.

The objective of this experimentation was to study the limit of equivalent ratio ( $\phi$ ) on mixing enhancement in a tone excited jet rich flame. The jet is pulsed by means of a loudspeaker-driven cavity and experiments are limited to very rich flames ( $\phi > 1.5$ ). The excitation frequency is chosen for the resonant frequency identified as a pipe resonance due to acoustic excitation. Methane, propane and butane are used to examine the effect of mixture property on the limit of equivalence ratio. Mixing is always enhanced in a methane/air flame as the excitation intensity increases. In the case of propane/air and butane/air flames, mixing enhancement can be obtained only when the equivalence ratio lies in the range from a certain value (the equivalence ratio limit) to infinity (non-premixed flame), irrespective of mean mixture velocities. It is also found that the equivalence ratio limit is related to flame instability: the lower the Lewis number, the higher the equivalence ratio limit. As the excitation intensity increases, flame separation occurs below the equivalence ratio limit: an inner (premixed) flame is transformed into a cellular flame which then moves upstream, but the height of an outer (non-premixed) flame is not decreased. Acoustic pressure measurements using a microphone are made to quantify the oscillating velocity. The oscillating velocity amplitude at the cellular flame position is proportional only to mean mixture velocity regardless of fuel type.

**97/05180 A long life zinc oxide-titanium oxide sorbent for moving bed reactors**

Copeland, R. *et al.* *Proc. Annu. Int. Pittsburgh Coal Conf.*, 1996, 13, (1), 578-583.

High efficiency and very low emissions are advantageous features of coal-fired gasifier combined cycles (GCCs). GCCs are in critical need of a method to remove the  $\text{H}_2\text{S}$  produced from the sulfur in the coal from the hot gases. There has been extensive research into hot gas clean-up systems, focused on the use of a zinc oxide-based sorbent. However, the previous sorbents show significant losses in sulfur capacity with cycling. The zinc oxide content and sulfur loadings were increased, while simultaneously improving the attrition resistance and this method produces long-life, low-cost sorbent containing zinc oxide. Sorbents are currently being tested under conditions simulating a moving-bed reactor for GCC.

**97/05181 Low energy buildings design—the EDAS experience**

Cronolly, E. *Energy World*, May 1997, 249, 8-11.

The Energy Design Advice Scheme (EDAS) is funded by the DTI, with the aim of improving the energy performance of buildings. It offers free and expert energy advice to architects and building professionals. The organisation's work is described along with commonly experienced problems. Two case studies are presented: (1) office development at the Exchange Brewery site, Sheffield and (2) the Eco Centre, Jarrow.

**97/05182 Method and apparatus for treating flue gases from coal combustion using precoat agent with heat exchange**

Kamimura, F. *et al.* *Jpn. Kokai Tokkyo Koho JP 09,173,768* [97,173,768] (Cl. B01D33/50), 8 Jul 1997, Appl. 95/353,214, 27 Dec 1995, 10 pp. (In Japanese)

The paper discusses the series of processes used to treat flue gas: denitration; introducing into an air-preheating reactor for heat recovery; adding pre-coat agent (e.g. activated carbon, coke) to the gas; introducing the cooled flue gas into a bag filter for dust collection; introducing into a gas-gas heat exchanger having Teflon-made tubes for further cooling and heat recovery, desulfurization; and introducing into another gas-gas heat exchanger for heating by hot gas from the previous heat exchanger to remove soot and heavy metals.

**97/05183 Method for generating energy from fossil fuel from marginal production wells**

Oudakker, G. *Neth. Appl. NL 95 00,586* (Cl. C10L3/00), 1 Nov 1996, Appl. 95/586, 27 Mar 1995, 5 pp. (In Dutch)

An energy-generating unit is placed in the immediate vicinity of the well, conveying the fossil fuel, optionally after pre-treatment, to the energy-generating unit that converts the fuel into useful energy, especially electricity. Multiple wells of a marginal field may be provided with an energy-generating unit, and the electrical power from the units combined and transmitted. This method is especially suitable for use on offshore wells whose production is <200,000  $\text{m}^3/\text{day}$  and would otherwise be shut down.

**97/05184 Methods used by ELSAM for monitoring precision and accuracy of analytical results**

Jensen, J. H. *Power Plant Chemical Technol., Int. Conf.*, 1997, 13/1-13/19.

The Elsam performs regular round robins for monitoring precision and accuracy of analysis results. The first round robin was started in 1974, and today five are underway. These focus on boiler water and steam, lubricating oils, coal, ion chromatography and dissolved gases in transformer oils. In addition to the power plant laboratories in Elsam, those from the rest of Denmark and abroad, both industrial and commercial, are involved. A comparison is made of the calculated standard deviations or reproducibilities and acceptable values. These values originate from ISO, ASTM and the like, or from own experience. The round robins are very suitable for