

98/00785 Unwanted volatile organic compounds (VOCs) from coal fluidized bed combustion

Mastral, A. M. *et al.* *DGMK Tagungsber.*, 1997, 9703, (Proceedings ICCS '97, Volume 2), 1087-1090.

Air pollution by polycyclic aromatic hydrocarbons (PAH) emissions from fluidized-bed combustion (FBC) of coal were studied from VOC emissions. The PAHs generated in the combustion of a sub-bituminous coal in fluidized-bed combustion were analysed at different temperatures maintaining constant the oxygen excess (20%) and ranging the oxygen excess maintaining the combustion temperature, 550°C. Synchronous fluorescence spectroscopy (FS) was used to analyse PAH and the main factor affecting PAH emissions from FBC of sub-bituminous coal was found to be the pyrolytic reactions between the radicals emitted and formed at the tap of the combustion reactor. The PAH emissions increased considerably when the percentage of oxygen in the combustion air decreased.

98/00786 Urinary excretion of phenols as an indicator of occupational exposure in the coke-plant industry

Bieniek, G. *Int. Arch. Occup. Environ. Health*, 1997, 70, (5), 334-340.

The paper examines the relationship between the level of exposure to o-cresol and of 2,4- + 2,5-, 3,4-, and 3,5-xyleneols, and the urinary excretion of their metabolites. The mixed exposure to phenolic derivatives was monitored for exposed workers during their work shift by personal air sampling of the breathing-zone air and by measurements of phenol, o-cresol, and xyleneol isomer concentrations in shift-end urine. Men working at a coke plant and non-exposed subjects were studied. Phenols in air and urine were determined by gas chromatography (GC) with flame ionization detection. Urine samples were extracted after acid hydrolysis of glucuronides and sulfates by solid-phase extraction and metabolites were identified by GC-mass spectrometry. The time-weighted average concentrations of phenol, cresol, and xyleneol isomers detected in breathing-zone air showed low exposure levels of the workers.

98/00787 Using advanced technologies to reduce motor vehicle greenhouse gas emissions

Difiglio, C. *Energy Policy*, 1997, 25, (14-15), 1173-1178.

The potential reduction in US greenhouse gas emissions that could be achieved by using advanced-technology motor vehicles and low-emission bio-fuels is quantified here. These two approaches are compared to a variety of other approaches to reduce transportation sector emissions. It is concluded that only strong fiscal measures can produce emission reductions as large as are available from advanced-technology vehicles and low-emission fuels. A technology strategy is offered that should make the benefits of these technologies likely to occur should the US enter into a binding agreement to limit US greenhouse gas emissions. Various policy scenarios that could result from such an agreement are presented with the result that the technology strategy to produce advanced-technology vehicles and bio-fuels remains the most viable and cost-effective approach to control the future growth of transportation-sector greenhouse gas emissions.

98/00788 Various energy sources and carbon dioxide problem

Nishino, T. *Kogoku Keizai*, 1997, 44, (9), 68-76. (In Japanese)

The paper focuses on changes in coal consumption, various fuel and coal, CO₂ emission and fuels, and CO₂ problems and energy in 21st century.

98/00789 What is the value of scientific knowledge? An application to global warming using the price model

Nordhaus, W. D. and Popp, D. *The Energy Journal*, 1997, 18, (1), 1-45.

Future climate change, as well as the costs and benefits of slowing climate change, presents governments with the enormous uncertainties. The value of improved information about a variety of geophysical and economic processes is evaluated. The value of information is estimated using the 'PRICE model' which is a probabilistic extension of earlier mode of the economics of global warming. The study uses five different approaches to estimating the value of information about all uncertain parameters and about individual parameters. It is estimated that the value of early information is \$1-2 billion for each year that resolution of uncertainty is moved toward the present. The paper claims the most important uncertain variables are the damages of climate change and the costs of reducing greenhouse gas emissions. Resolving the uncertainties about these two parameters would contribute 75% of the value of improved knowledge.

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Fundamental Science, Analysis, Instrumentation

98/00790 Analysis of pyrolysis reactions of various coals including argonne premium coals using a new distributed activation energy model

Maki, T. *et al.* *Energy Fuels*, 1997, 11, (5), 972-977.

The author presents a simple method for estimating $f(E)$ and k_0 —the distributed activation energy model (DAEM). It was applied to pyrolysis reactions analysis of 19 different coals, including eight Argonne premium coals. First, $f(E)$ and k_0 for the changes in total volatiles were estimated using the thermogravimetric curves measured at three different heating rates for all the coals. $f(E)$ curves depended greatly on coal rank, whereas the reverse was true for k_0 vs E relationships, inferring the similarity of the pyrolysis reactions for all the coals. The validity of the method was clarified by comparing the predicted thermogravimetric curves with the experimental ones.

98/00791 Apparatus for continuous carbonization of solid wastes to obtain carbonaceous material and clean flue gas

Fujiwara, T. *Jpn. Kokai Tokkyo Koho JP 09,241,650 [97,241,650]* (Cl. C10B53/02), 16 Sep 1997, Appl. 96/97,298, 13 Mar 1996, 5 pp. (In Japanese)

A carbonization furnace with a chamber for accommodating the crushed wastes and a burner for combustion of the wastes under near oxygen-free condition to obtain carbonaceous material and flue gas are part of the apparatus. Another burner for complete combustion of the flue gas to obtain soot-free colourless and odourless flue gas is also included.

98/00792 Apparatus for manufacture of zeolite

Tajiri, T. *Jpn. Kokai Tokkyo Koho JP 09,255,325 [97,255,325]* (Cl. C01B39/02), 30 Sep 1997, Appl. 96/96,288, 25 Mar 1996, 5 pp. (In Japanese)

This apparatus contains static line mixers for passing the slurries containing fly ash and NaOH and mixing and circulating loop lines with pumps for circulating slurries. It comprises methods for continuously supplying the slurries to the loop lines and for continuously exhausting one part of the slurries. The apparatus is suitable for power generation.

98/00793 CFD simulations on a coal-coal reburning test facility

Vonderbank, R. S. *Int. J. Energy Res.*, 1997, 21(11), 985-1010.

In fossil-fired steam generators, fuel staging or fuel re-burning is a possible primary measure for the reduction of NO_x emissions. The paper investigates if it can be efficiently applied to coal-fired combustion systems where pulverized coal is also used as a reburning fuel: coal reburning over a coal fire. ENEL SpA and ANSALDO Energia SpA are currently evaluating the option of demonstrating and extending the use of this technology in ENEL SpA's coal-fired utility steam generators. Both companies have decided to erect a boiler simulation facility at ENEL experimental area Santa Gilla (Cagliari). This facility is intended to replicate the time/temperature profiles of real boilers. One tool to support the design of firing systems is CFD simulation. Consequently, CFD simulation was applied to perform a proof of concept. Most important for the design of firing systems for the furnaces of utility steam generators or test facilities is the distribution of temperature inside the combustion chamber and the furnace exit temperature, especially the radiation transport responsible for the amount of energy transferred from the gaseous environment of the hot furnace to the furnace walls. The accuracy of temperature calculations depend directly on the radiation transport model, the gas emissivity approximations, the particle emissivity and the radiative properties of the furnace enclosure. The results of several combustion simulations of the coal reburning process itself and on the gas temperature inside the furnace are presented.

98/00794 Change of unit skeletons during an artificial coalification

Sugimoto, Y. *et al.* *Sekitan Kagaku Kaigi Happyo Ronbunshu*, 1996, 33, 137-140. (In Japanese)

In water at 200-400°C, cellulose was thermally decomposed. The artificial coals obtained were hydrogenated over a presulfided Ni-Mo/Al₂O₃ catalyst at 350°C in tetralin. The toluene-insoluble product containing the catalyst was further hydrocracked at 425°C in tetralin. The distillable components were analysed by a capillary CC-MS, and the distribution of the polycyclic compounds were compared.