internal surface without any blocking of the micropores and macropores is usually considered to be important to keep the impregnation agent accessible for the reactants. However, in this case, the impregnated activated carbon is not selective : the adsorptive removal of further gas impurities can also take place. In this work, we propose a new impregnated activated carbon for the selective removal and the fractionation of VOC's mixtures in exhaust humid gas.

91.
ACTIVATED CARBON FIBERS AND FILMS DERIVED FROM POLYVINYLIDENEFLUORIDE. ***Junya Yamashita[1]**, Toyonari Hirano[2], Masatoshi Shioya[2], Takeshi Kikutani[2], and Toshimasa Hashimoto[2]. (1) Department of Energy Resources, Carbon Material Division, National Institute for Resources and Environment, 16-3, Onogawa, Tukuba-shi, Ibaragi, 305-8569, Japan, Fax: +81-298-61-8408, jyamasit@mail2.nire.go.jp, (2) Department of Organic and Polymeric Materials, Tokyo Institute of Technology*

In order to produce activated carbons with different pore sizes from those derived by the conventional heat-treatment of organic compounds, an attempt has been made to carry out a part of the conversion process through a liquid phase chemical treatment. Poly(vinylidene fluoride) (PVDF) fibers and films were converted to activated carbons by the combination of chemical dehydrofluorination using a strong base, high-temperature heat-treatment and activation in a carbon dioxide gas. By using nitrogen gas and methylene blue (MB) as adsorbates, porous structure and adsorptive properties of PVDF based activated carbons were investigated. The activated carbons prepared by applying appropriate degree of chemical dehydrofluorination were highly mesoporous and exhibited superior methylene blue adsorption of 0.54 g/g. The relation between gasification and development of porous structure in PVDF based carbons during activation process were also discussed.

92.
ACTIVATED CARBON FIBERS FROM NON-CONVENTIONAL PITCH PRECURSORS. ***Rodney Andrews**, Marit Jagtoyen, David Jacques, and Terry Rantell, Center for Applied Energy Research, University of Kentucky, 2540 Research Park Drive, Lexington, KY 40511, Fax: 606-257-0220, andrews@caer.uky.edu*

The influence of pitch precursor composition on the properties of isotropic pitch fibers derived from non-conventional precursors was examined. During the oxidative stabilization of green fibers, fiber axial contraction is found to decrease with increasing weight gain. Weight gain upon stabilization also increases, and the contraction decreases, with increasing pitch carbon content and aromaticity. The opposite effect is seen with increasing heteroatom content (H, N, O and S). Similar trends are found for fiber carbonization. The net yield increases with pitch carbon content and aromaticity, and decreases with heteroatom content. The fiber tensile strength increases with pitch precursor carbon content, carbon yield and aromaticity. The activation rate of the derived fibers increased with increasing heteroatom content, especially oxygen content. While most fibers were microporous upon activation, fibers from shale oil derived pitch were mesoporous after activation.

93.
INCORPORATING CO_2 SEQUESTRATION AND COAL-BED METHANE RECOVERY INTO HYDROGEN PRODUCTION FROM COAL: ECONOMICS AND ENVIRONMENTAL ASPECTS. ***Pamela Spath**, and Wade Amos, National Renewable Energy Laboratory, 1617 Cole Boulevard, Golden, CO 80401, Fax: 303-275-2905*

A hydrogen production process using pressure swing adsorption (PSA) for purification results in a concentrated CO_2 gas stream. In a typical natural gas steam reforming process this stream is used to fuel the reformer. However, because coal gasification takes place at high temperatures the synthesis gas contains very little CH_4 and other hydrocarbons, therefore, reforming is not required. An analysis was performed to examine hydrogen production via gasification of low sulfur western coal with CO_2 sequestration of the PSA off-gas. This stream is then used to displace methane from unmineable coalbeds and the methane is utilized within the gasification-to-hydrogen system. Several processing schemes were evaluated: a reference case, a CO_2 sequestration only case, a maximum hydrogen production case, and a hydrogen/power coproduction case. The purpose of the analysis was to examine the technoeconomic feasibility, CO_2 emissions, and energy balance of these systems. This paper discusses the cases examined and presents the results of this study.

94.
GEOTHERMAL POWER PRODUCTION UTILIZING SUPERCRITICAL CO_2 COMBINED WITH DEEP EARTH CARBON SEQUESTRATION. ***Donald W. Brown**, Earth and Environmental Sciences Division, Los Alamos National Laboratory, Mail Stop D443, Los Alamos, NM 87545, Fax: 505-667-8487, dwb@lanl.gov*

A new geothermal energy concept - heat mining using supercritical CO_2 to both create the man-made geothermal reservoir and for heat transport - is here proposed. This concept builds on the previous extensive Hot Dry Rock (HDR) research conducted by Los Alamos National Laboratory during the successful field testing of two separate, deep confined reservoirs for almost a year each. However, using CO_2 in a closed-loop HDR system offers two significant advantages over a water-based system: (1) an enhanced buoyant drive (i.e., thermal siphoning) which would drastically reduce circulating pumping-power requirements and (2) the almost total absence of mineral dissolution and transport. The commercial development of this new concept, given the ubiquitous worldwide distribution of the HDR geothermal resource, could be a significant contributor to providing clean, renewable sources of energy and to mitigating global warming. The latter obtains since a supercritical-CO_2-based HDR system would sequester significant amounts of CO_2 deep in the earth by the continuous high-pressure diffusion of CO_2 into the rock mass surrounding the HDR reservoir.

95.
TRI-REFORMING: A NEW PROCESS CONCEPT FOR EFFECTIVE CONVERSION AND UTILIZATION OF CO_2 IN FLUE GAS FROM ELECTRIC POWER PLANTS. ***Chunshan Song**, Applied Catalysis in Energy Laboratory and Department of Energy & Geo-Environmental Engineering, Pennsylvania State University, 206 Hosler Building, University Park, PA 16802, Fax: 814-865-3248, csong@psu.edu*

A new process concept, tri-reforming, is proposed for effective conversion and utilization of CO_2 in the waste flue gases from fossil fuel-based power plants in the 21st century. In the proposed tri-reforming (simultaneous oxy-CO_2-steam reforming) process, the flue gas and natural gas are used as chemical feedstocks for production of synthesis gas ($CO+H_2$) with desired H_2/CO ratios. The H_2O and O_2 in the flue gas need not be pre-separated because they will be used as co-reactants for the tri-reformingof natural gas. The CO_2 from flue gas in the power plant can be converted with CH4 (natural gas) to form synthesis gas using the 'waste heat' in the power plant and heat generated in situ from oxidation with the O2 that is already present in flue gas. The tri-reforming is a synergetic combination of CO_2 reforming, steam reforming, and partial oxidation of natural gas. This tri-reforming process could be applied, in principle, for natural gas-based or coal-based power plants and IGCC power plants. The widely-studied CO_2 conversion processes begin with CO_2 separation and recovery from flue gases and the subsequent purification, which are all energy-consuming steps that can lead to additional CO_2 emission. The proposed tri-reforming process aims at the use of CO_2 for more efficient production of industrially useful products that can have large-scale demands, without the conventional CO_2 separation , recovery and purification. Once produced from tri-reforming, the synthesis gas can be used for the production of industrial chemicals, ultra-clean transportation fuels, and electricity. The tri-reforming is the key process for the proposed CO_2-based tri-generation of chemicals, fuels, and electricity.

96.
MANAGING GREENHOUSE GAS EMISSIONS: STRATEGIES AND DEVELOPMENTS IN AUSTRALIA. ***Brian C. Young**, Envirosafe Independent Consultancy, 1A Yarrbat Avenue, Balwyn, VIC 3103, Australia, Fax: 61-3-9830-1678, byoung@envirosafe.com.au, and D. J. Allardice, Allardice Consulting*

Australia is only a minor contributor to greenhouse gas (GHG) emissions globally but is a major contributor on a per capita basis. Owing to its dependence on coal-fired electricity generation, its energy intensive industries such as mining, aluminium, iron and steel, as well as its agriculture and land clearing practices, Australia's GHG emissions have already risen to 111% of the baseline 1990 levels. Consequently the Australian Government has moved from its previous 'no regrets' GHG abatement policies to issue new initiatives ranging