BIOCOMBUST
Biomass, Energy, Health

GIERÉ R, MASCHOWSKI C, MERFORT I, KÖNCZÖL M, DORNHOF R, DIETZE V, KAMINSKI U, NAZARENKO I, MERSCH-SUNDERMANN V, GMINSKI R, TROUVÉ G, DIETERLEN A, KLEINPETER J, DREWNICK F, FREUTEL F AND KRUSPAN P

[1]Universität Freiburg, Germany (*giere@uni-freiburg.de)
[2]Umweltmedizin, Universitätsklinik Freiburg, Germany
[3]Lufthygiene, Deutscher Wetterdienst, Freiburg, Germany
[4]Université de Haute-Alsace, Mulhouse, France
[5]ASPA, Schiltigheim, France
[6]Max-Planck-Institut für Chemie, Mainz, Germany
[7]Holcim (Schweiz) AG, Würenlingen, Switzerland

BIOCOMBUST is a large-scale international research project on health aspects of biomass combustion. Funded by the European Union through its Funds for Regional Development (INTERREG IV Upper Rhine program), it is a cross-border collaboration between several research teams with widely differing expertise, including: mineralogy; geochemistry; pharmaceutical science; environmental medicine; combustion science; aerosol science; human biometeorology; and cement manufacturing.

The research explores the impacts of particulate emissions from biomass combustion on air quality and health. To evaluate these effects, various experiments are performed, including: biomass combustion in the laboratory, district heating facilities, and power plants; chemical, mineralogical, and structural characterization of biomass, particulate emissions, and ashes; optimization of combustion conditions; determination of ash and particulate-emission properties in relation to type of biomass, firing conditions and cooling path; identifying and tracking of particulate plumes as well as collection of emitted particulates around industrial biomass-combustion facilities; determination of cytotoxic, genotoxic, and proinflammatory effects in human lung cells as a result of particulate exposure; determination of the potential of particles to generate reactive oxygen species in human lung cells; investigation of the molecular mechanisms underlying the cell responses to particulate exposure.

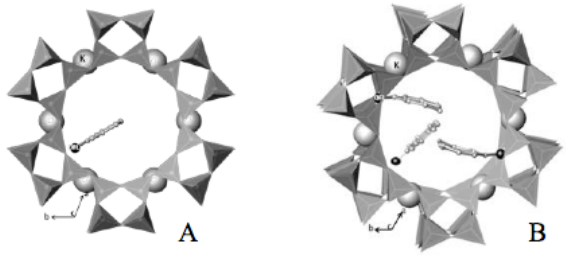
The expected results will provide a basis for technical and economic applications, which eventually will lead to an improvement of both environmental and living conditions. In addition, the results will give an important boost to the sustainable expansion of the biomass industry and to the potential use of the associated ashes as secondary raw materials for the cement industry.

Fluorenone dye- zeolite L hybrid: a novel optical material

GIGLI L[1]., ARLETTI R[2]., QUARTIERI S[3]., VEZZALINI G[1].

[1]Department of chemical and Geological Sciences, University of Modena and Reggio Emilia, Italy,
[2]Department of Earth Sciences, University of Torino, Italy
Department of Earth Sciences- University of Messina, Italy

A major challenge facing humanity is developing renewable source of energy. Following the biological blueprint of the natural photosynthesis is possible design synthetic systems for converting light into stored energy: the so called artificial antenna systems. The encapsulation of ordered chromophore molecules into one dimensional zeolite channel systems results in host-guest compounds suitable for the development of novel optical materials such as lenses, infrared light-emitting diodes (used in telecommunications) or dye nanostructured materials for optical data storage [1]. X-ray powder diffraction study of zeolite K-L loaded with 0.5, 1, 1.5, 2 fluorenone-dye (FL) molecules per unit cell (ZL/FL hybrid) [2], was carried out to understand the functionality of these host-guest systems from the structural point of view. These data evidenced a significant change of the unit cell parameters due to the embedding of FL into the ZL 12-membered channels. The Rietveld refinements revealed that the maximum loading is 1.5 FL molecules per unit cell. A strong interaction between FL carbonyl group and two



extraframework potassium cations is proved by the short bond distances which make this composite very stable.

Fig.1 Projection along *c* axis of the ZL/FL (1 molecule) (A) and ZL/FL (1.5 molecules) composites (B) .

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