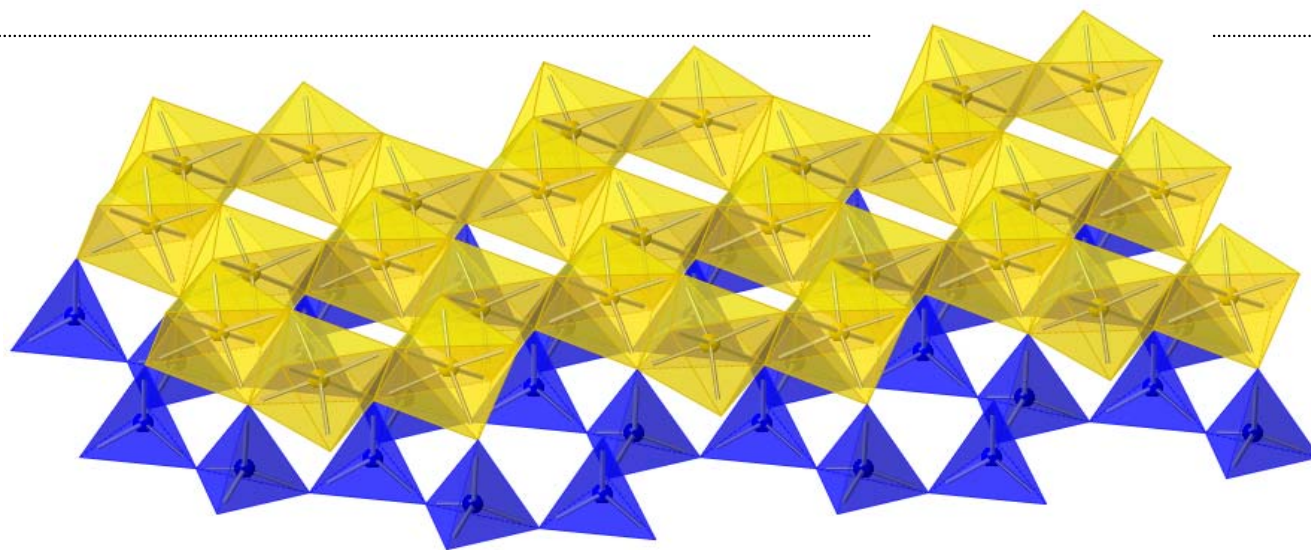


# The synthesis approach for the intercalation of photoactive molecules into kaolinite and layered zirconium phosphate

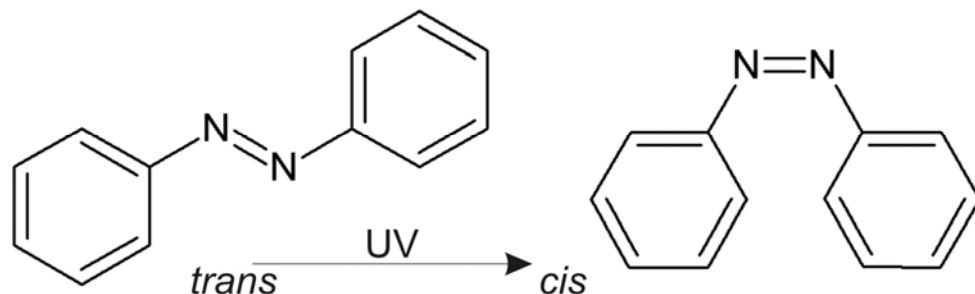


**Anna Koteja, Anna Łepko, Jakub Matusik**

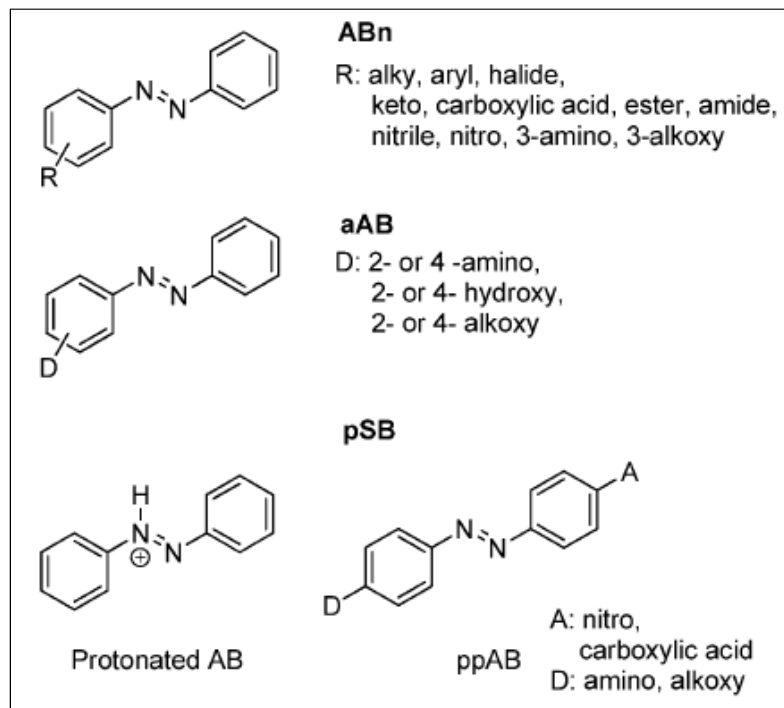
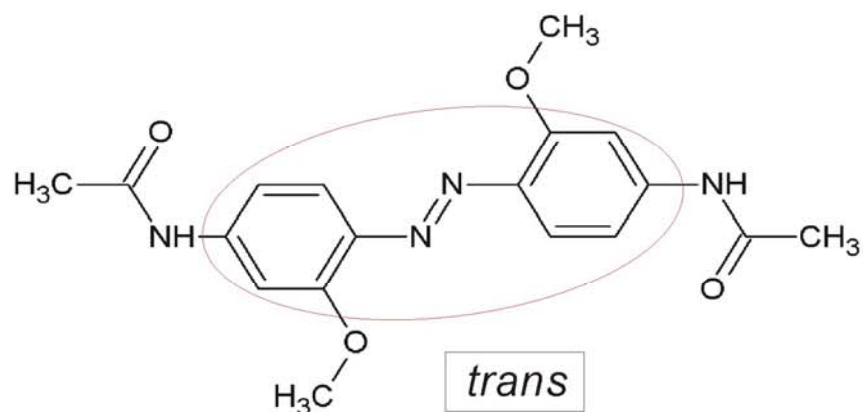
Department of Mineralogy, Petrography and Geochemistry  
Faculty of Geology, Geophysics and Environmental Protection  
**AGH University of Science and Technology, Krakow, Poland**



## Photoactive molecules

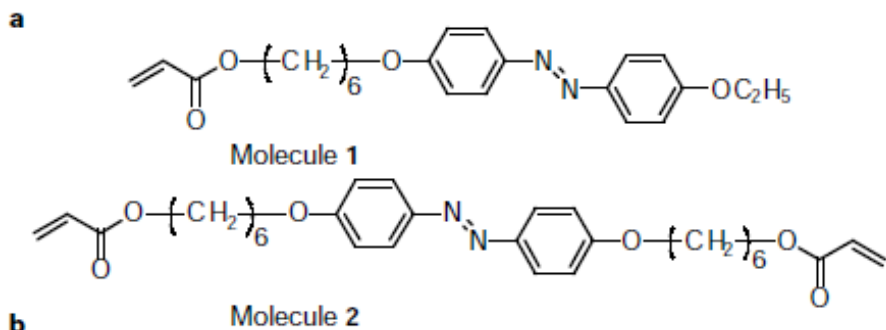


## azobenzene



## substituted-azobenzene

## Control of polymer bending direction



### brief communications

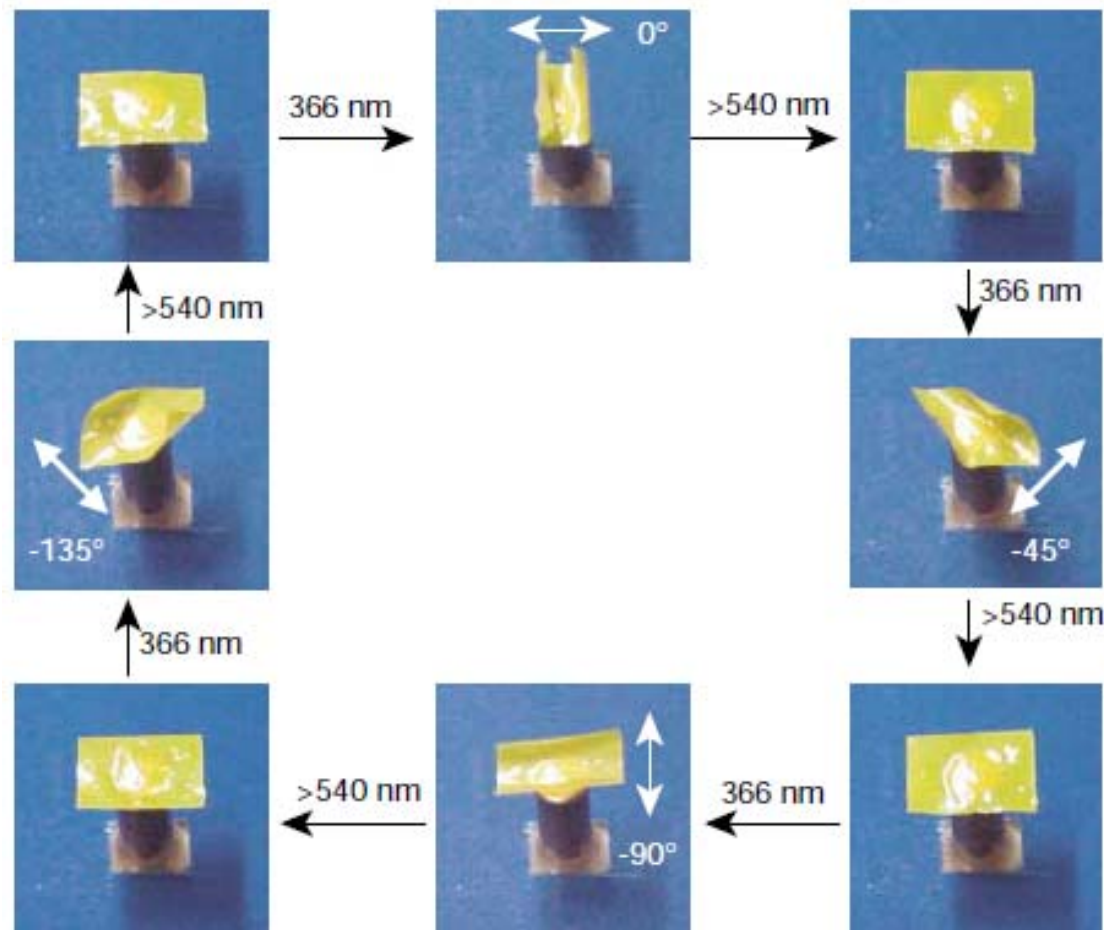
### Directed bending of a polymer film by light

Miniaturizing a simple photomechanical system could expand its range of applications.

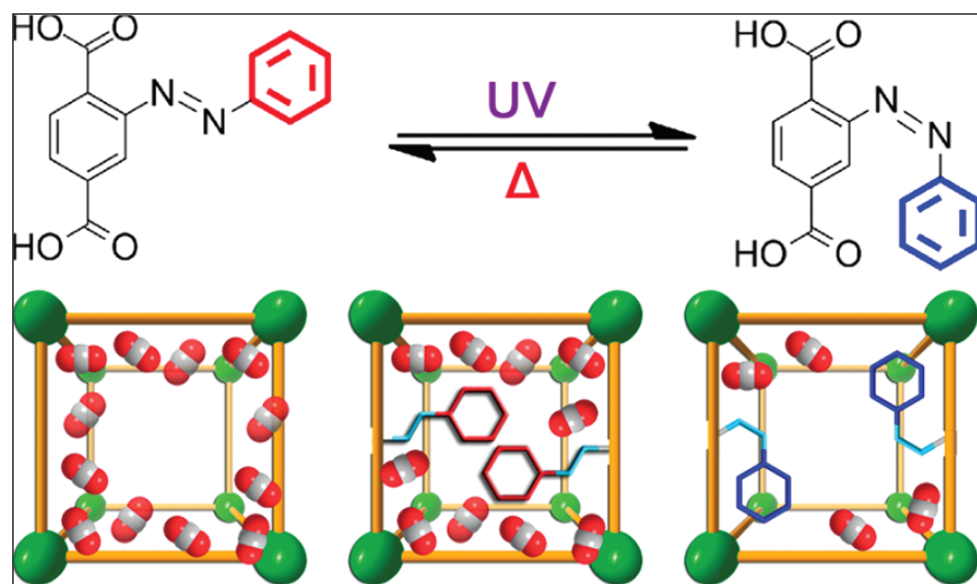
Polymer solutions and solids that contain light-sensitive molecules can undergo photo-contraction, whereby light energy is converted into mechanical energy<sup>1-8</sup>. Here we show that a single film of a liquid-crystal network containing an azobenzene chromophore can be repeatedly

azobenzene liquid-crystal moieties aligned in one direction in each domain, although macroscopically the direction of alignment is random. On irradiation of the film with linearly polarized light, the selective absorption of light of a specific direction leads to a *trans-cis* isomerization of the azobenzene

aid of batteries, motors and gears, using remote irradiation with laser beams.  
 Yanlei Yu, Makoto Nakano, Tomiki Ikeda  
 Chemical Resources Laboratory, Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku, Yokohama 226-8503, Japan  
 e-mail: tiked@res.titech.ac.jp



## Control of sorption properties



**J | A | C | S**  
JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

### Reversible Alteration of CO<sub>2</sub> Adsorption upon Photochemical or Thermal Treatment in a Metal–Organic Framework

Jinhee Park, Daqiang Yuan, Khanh T. Pham, Jian-Rong Li, Andrey Yakovenko, and Hong-Cai Zhou\*

Department of Chemistry, Texas A&M University, College Station, Texas 77842, United States

 Supporting Information

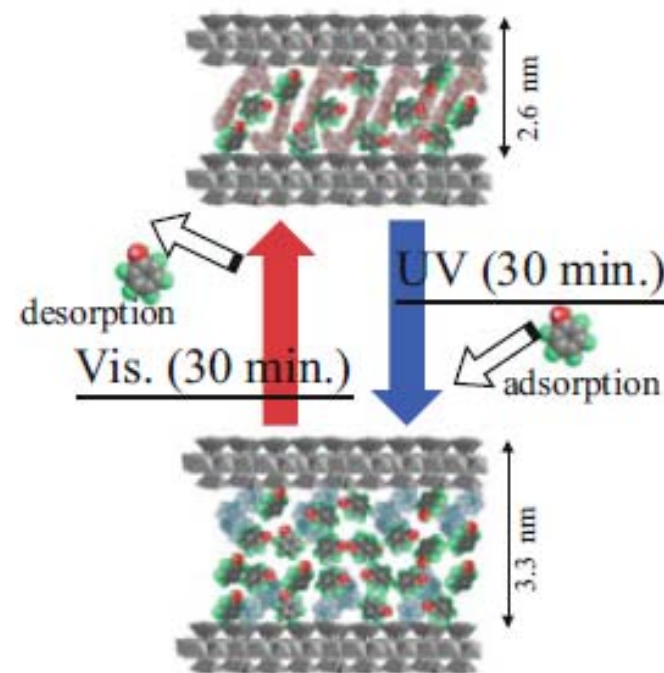
Communication  
pubs.acs.org/JACS

### Photocontrol of the adsorption behavior of phenol for an azobenzene-montmorillonite intercalation compound†

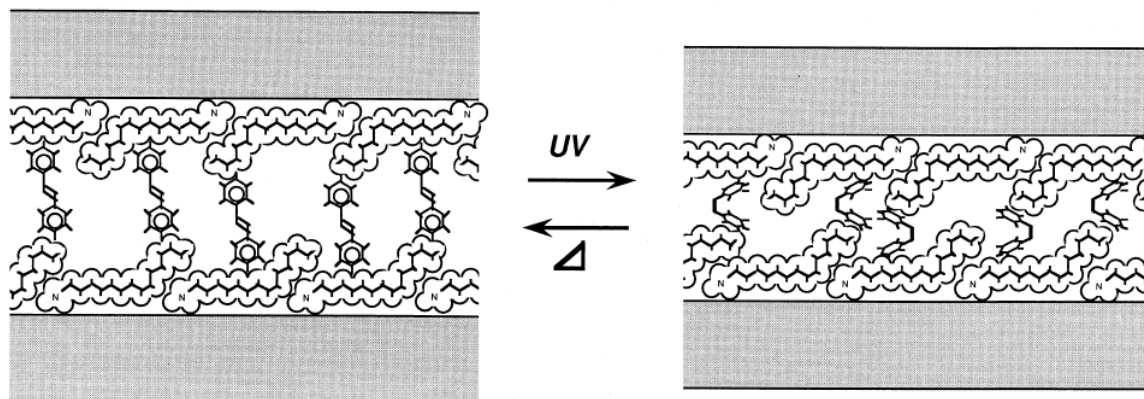
Tomohiko Okada,<sup>\*a</sup> Yusuke Watanabe<sup>a</sup> and Makoto Ogawa<sup>\*b</sup>

COMMUNICATION

ChemComm  
www.rsc.org/chemcomm



## Control of interlayer distance



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

SCIENCE @ DIRECT®

Materials Research Bulletin 38 (2003) 2009–2017

Materials  
Research  
Bulletin

[www.elsevier.com/locate/matresbu](http://www.elsevier.com/locate/matresbu)

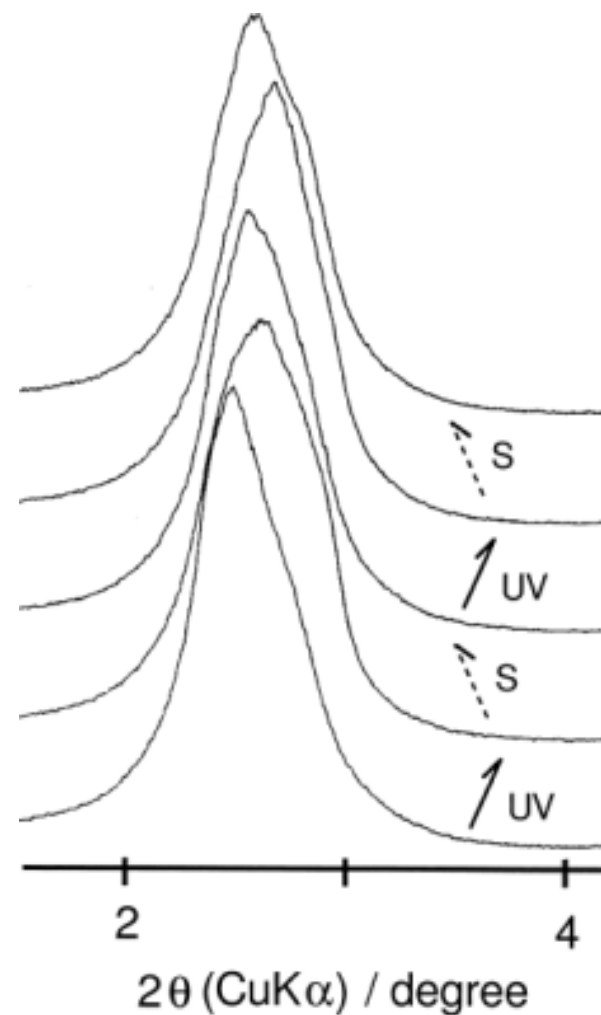
### Photomechanical response of azobenzene/organophilic mica complexes

T. Fujita<sup>a,\*</sup>, N. Iyi<sup>a</sup>, Z. Klapys<sup>b</sup>, K. Fujii<sup>a</sup>, Y. Kaneko<sup>a</sup>, K. Kitamura<sup>a</sup>

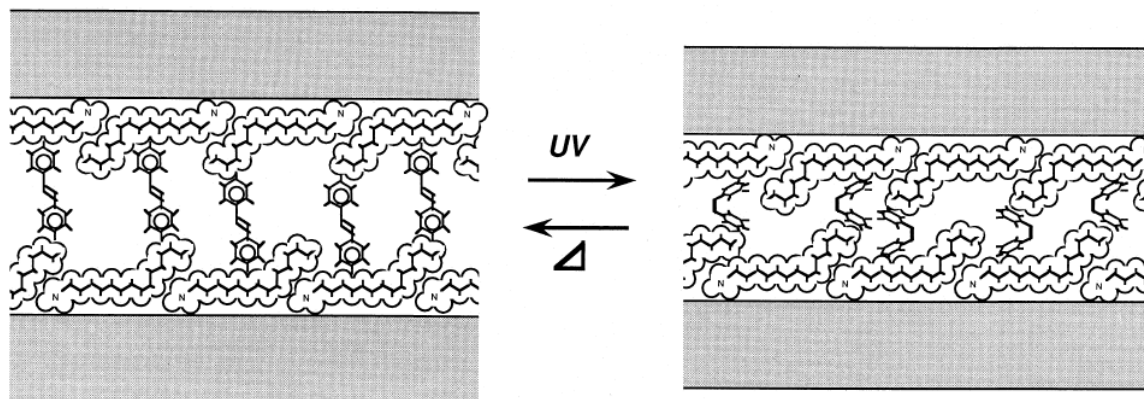
<sup>a</sup>Advanced Materials Laboratory, National Institute for Materials Science, Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan

<sup>b</sup>Faculty of Geology, Geophysics and Environmental Protection, University of Mining and Metallurgy in Krakow, al. Mickiewicza 30, 30-059 Krakow, Poland

Received 21 November 2002; received in revised form 31 May 2003; accepted 4 September 2003



## Control of interlayer distance



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

SCIENCE @ DIRECT®

Materials Research Bulletin 38 (2003) 2009–2017

Materials  
Research  
Bulletin

[www.elsevier.com/locate/matresbu](http://www.elsevier.com/locate/matresbu)

### Photomechanical response of azobenzene/organophilic mica complexes

T. Fujita<sup>a,\*</sup>, N. Iyi<sup>a</sup>, Z. Klapys<sup>b</sup>, K. Fujii<sup>a</sup>, Y. Kaneko<sup>a</sup>, K. Kitamura<sup>a</sup>

<sup>a</sup>Advanced Materials Laboratory, National Institute for Materials Science, Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan

<sup>b</sup>Faculty of Geology, Geophysics and Environmental Protection, University of Mining and Metallurgy in Krakow, al. Mickiewicza 30, 30-059 Krakow, Poland

Received 21 November 2002; received in revised form 31 May 2003; accepted 4 September 2003

Structure and Bonding 166  
Series Editor: D.M.P. Mingos

Dongpeng Yan  
Min Wei Editors

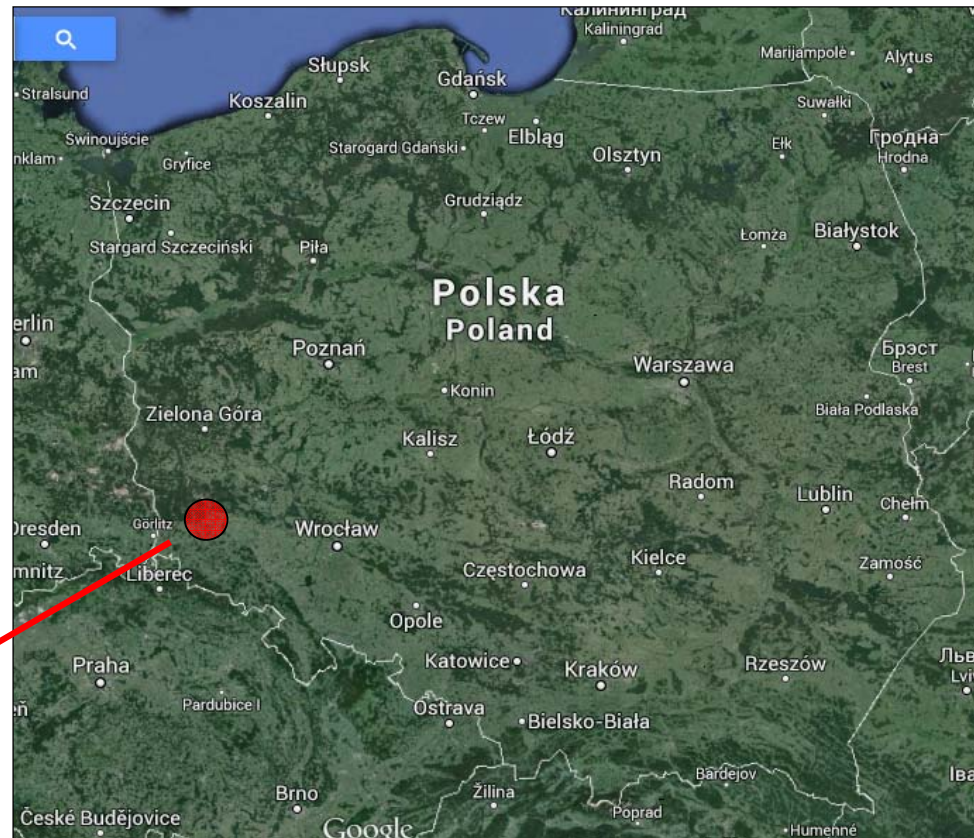
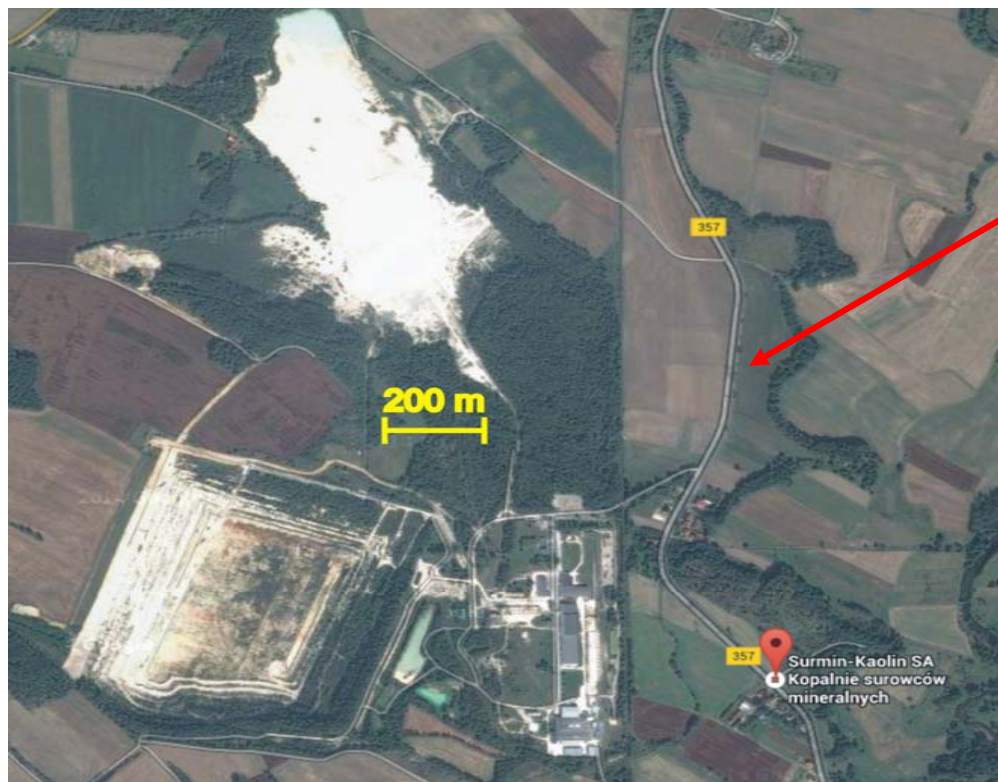
## Photofunctional Layered Materials

 Springer

- to synthesize **kaolinite** and **zirconium phosphate** intercalation compounds with photoactive molecules
- to examine **structural features** of the obtained hybrid materials
- to investigate possible **photomechanical behaviour** of the materials

## Kaolinite

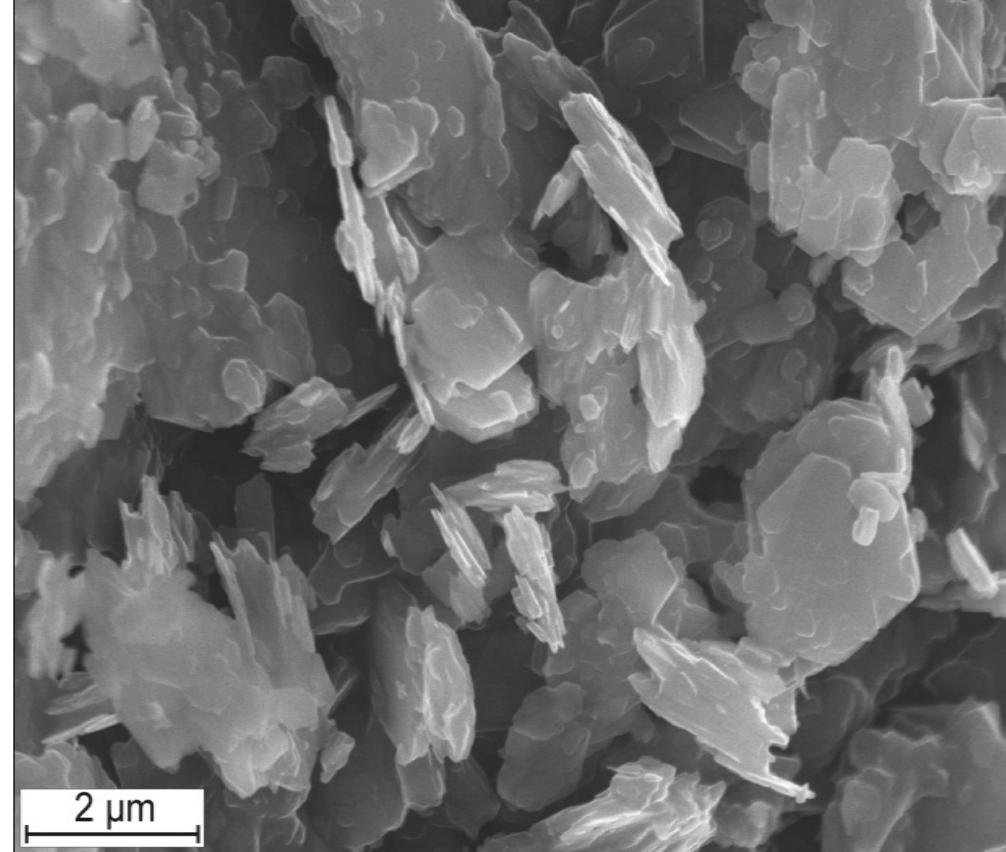
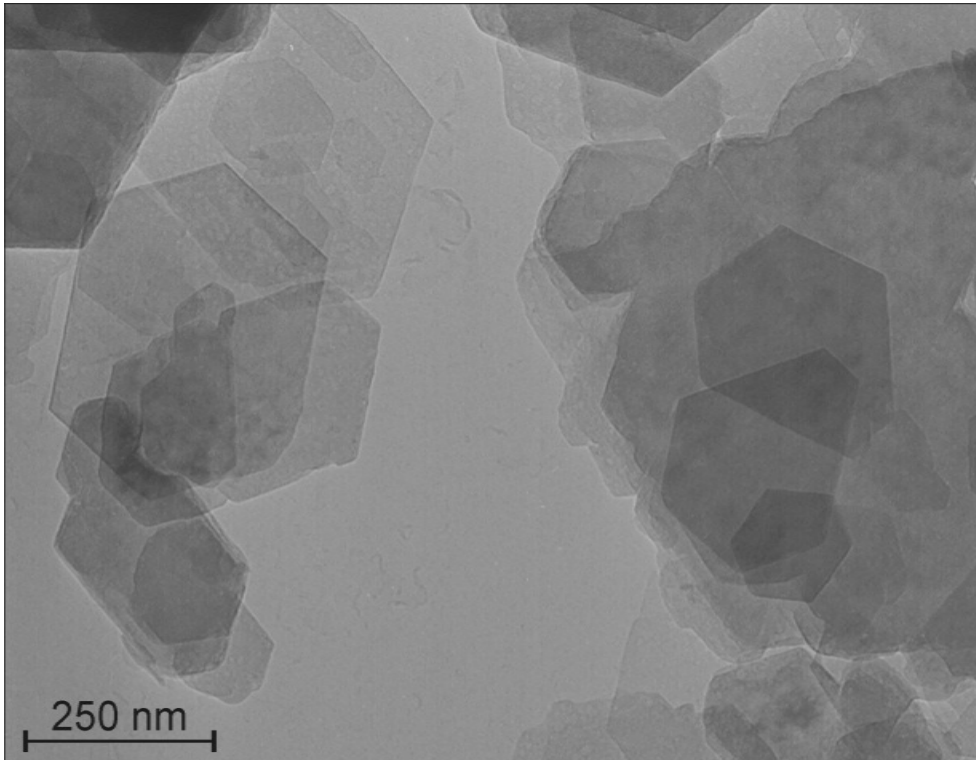
- Maria III deposit (M)
- **HI** = 1.31
- fraction:  $<15 \mu\text{m}$  - 98%



|           |     |
|-----------|-----|
| Kaolinite | 80% |
| Illite    | 11% |
| Quartz    | 9%  |

## Kaolinite

- Maria III deposit (M)
- **HI** = 1.31
- fraction: <15  $\mu\text{m}$  - 98%

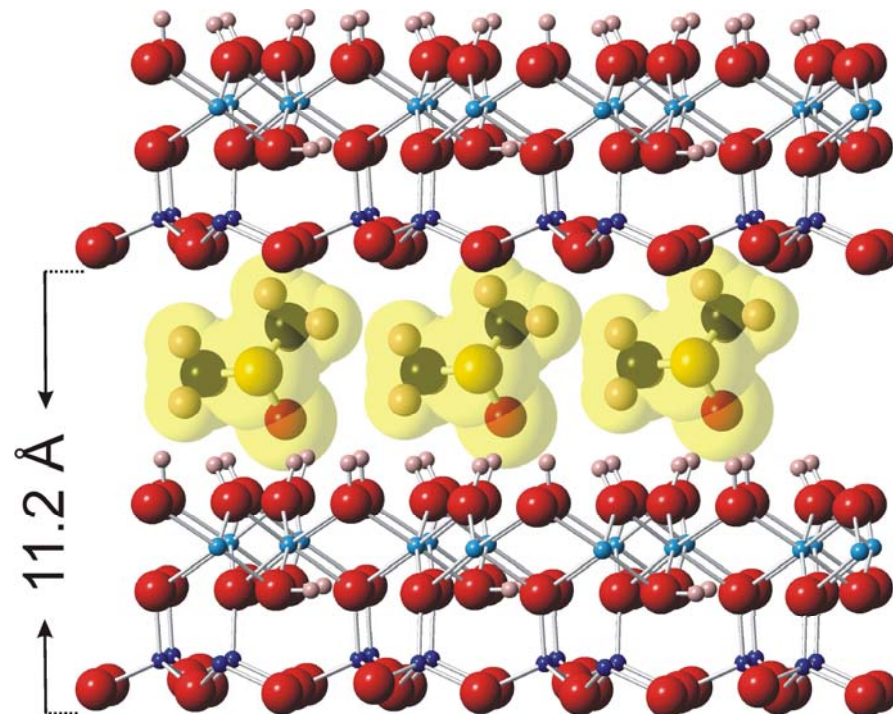
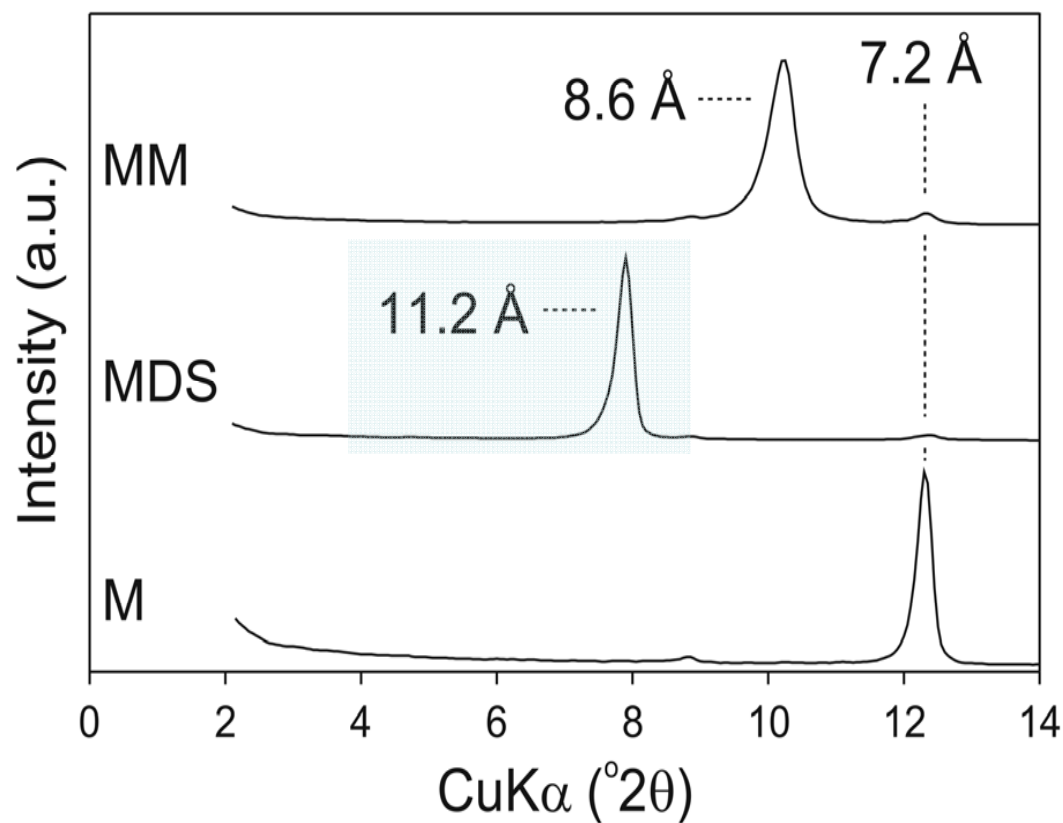


|           |     |
|-----------|-----|
| Kaolinite | 80% |
| Illite    | 11% |
| Quartz    | 9%  |



*DMSO* - dimethyl sulfoxide, *RT* - room temperature, *S* - quaternary ammonium salt

## Step 1

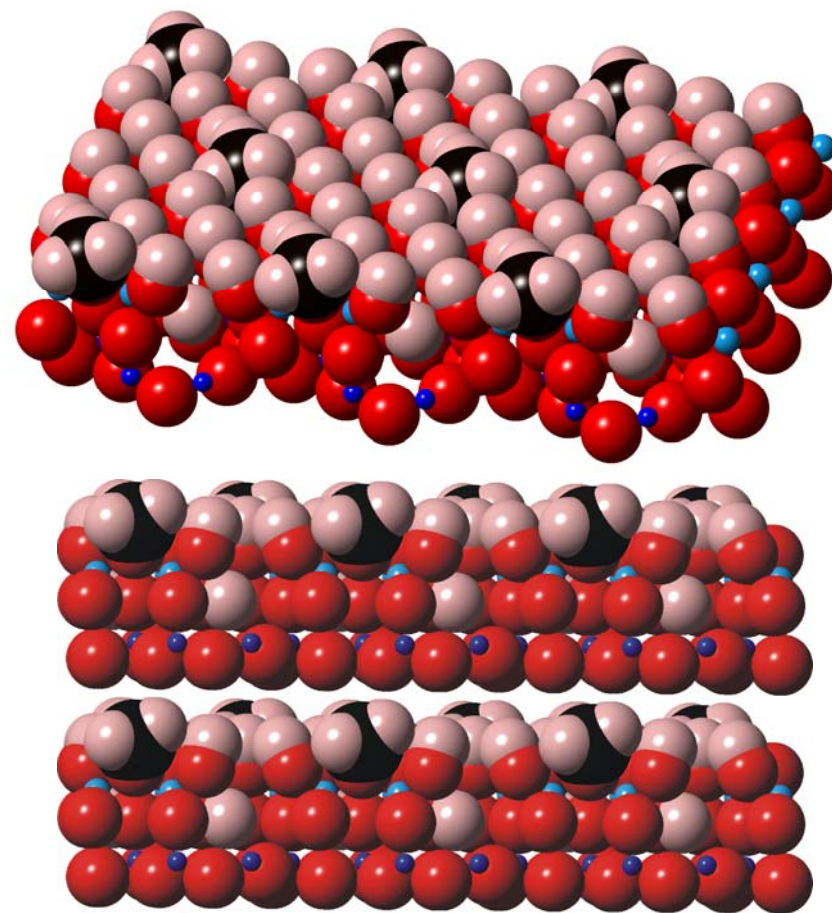
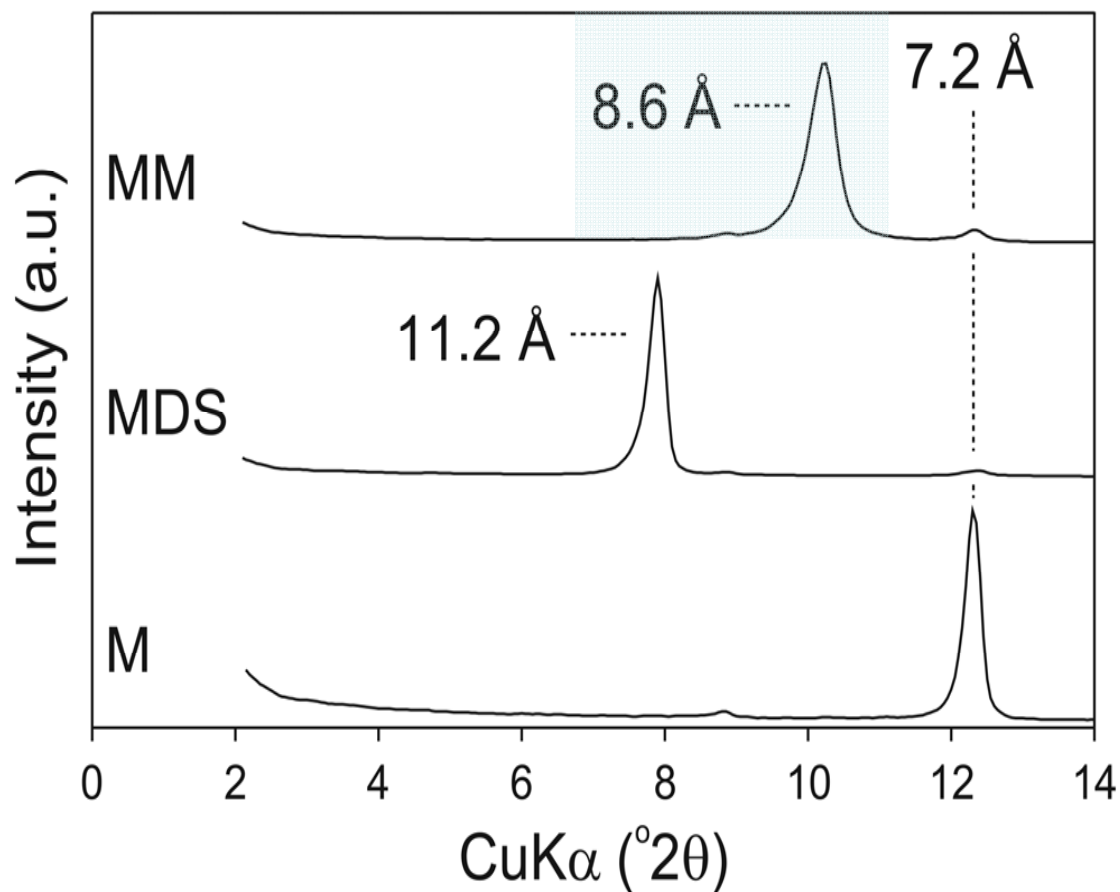


**DMSO-intercalate**



*DMSO* - dimethyl sulfoxide, *RT* - room temperature, *S* - quaternary ammonium salt

## Step 2



**Methoxy-kaolinite**

