The **DiSiDo** Project

Innovative and motivating

Who?

Industry
WACKER

Academia
Chemistry Didactics Dept.

What?

Discovering **Si**licones **Do**cumentation
CD and internet

For whom?

Teachers, pupils and students
Classroom, lectures, home study

Why?

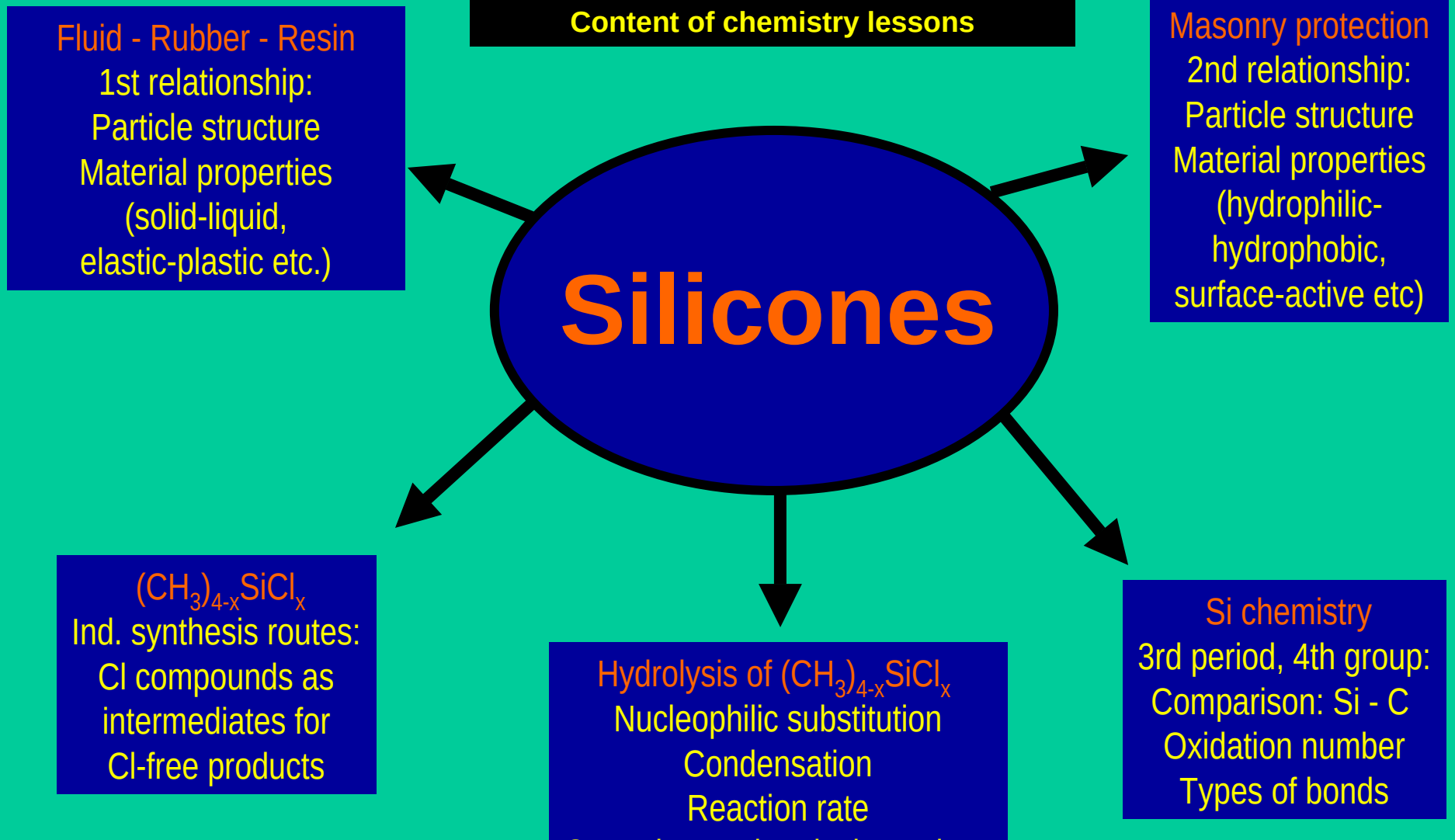
- **Silicone chemistry education: realistic and multimedia experience**
- **Use and encourage multimedia and IT skills**
- **Supported with WACKER products (silicones) and materials (lab set)**

DiSiDo Project

Educational aspects

Links

Content of chemistry lessons



DiSiDo Project
Worksheets

- The worksheets link together aspects of silicone chemistry with the topics of the chemistry lesson.
  (Crosslinking: Silicone chemistry - Systematic chemical subjects)

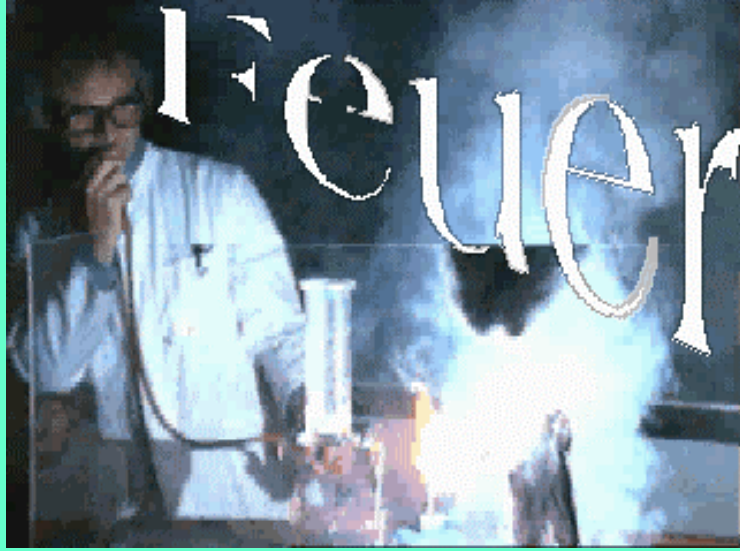
- The worksheets may in some cases be used during lessons and in some cases to extend, deepen and apply what is taught in lessons.

- Generally, the exercises in the worksheets are hyperlinked to experiments.

Total worksheets: 43

DiSiDo Project

Instructional multimedia



Videos…

… are for *supplementing classroom experiments*. Observation are relived and strengthened. At home, pupils can use the videos to refresh their memories when preparing for tests or class projects. In some cases, they can even replace experiments, for example, when hazardous substances are involved or when the experiments are too expensive or time-consuming. (This should be the exception to the rule!)

Flash animation...

...is designed so that the *various features,* ranging from the phenomena (e.g. beading of water droplets on an impregnated concrete brick) to explanations at molecular level with the aid of molecular structures and molecular interactions, can be called up *stepwise, in motion pictures, intelligibly and interactively.* The are intended for use during lessons and home study.

A total of 7 videos in 2 versions and 2 flash packages with approx. 15 animations

Impregnation with silicones

Structure of a teaching module

1. Establishing what pupils already know

Pupils are asked about hydrophobic and hydrophilic materials found in everyday life and what they know of the molecular structure.

2. Goal setting

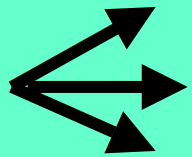
The necessity for impregnation of certain structures is discussed.
The task of impregnating aerated concrete as efficiently as possible is set.

3. Experiments to resolve the problem

Experiments involve coating bricks with paraffin oil, paraffin wax and silicone fluid
Water is applied to treated and untreated bricks.

4. Explanation of the experimental results

Explanation, with the help of molecular structures, of why thin layers of silicones adhere to brick and yet are still highly water repellent.



Silicones as antifoams

Structure of a teaching module

1. Finding out what the pupils already know

The pupils' knowledge of surfactants in detergents, and their properties, structure and functional models (hydrophilic head, hydrophobic tail) is established.

2. Goal setting

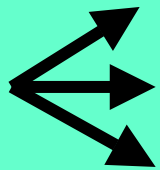
The disadvantages of foam formation during use of surfactants are discussed. The task of making weakly foaming and strongly foaming surfactants is set and discussed.

3. Experiments to resolve the problem

Experiments are performed on the antifoam action of silicones with simultaneous preservation of the surface-active properties.

4. Explanation of the experimental results

Explanation, with the aid of molecular structures, of why silicones destroy foam in a surfactant solution, but do not hinder the formation of emulsions.



Plastic, elastic, viscoelastic

Structure of a teaching module

1. Finding out what the pupils already know

Everyday objects are used to establish the pupils' knowledge of the terms "elastic," "plastic" and "viscous" and their explanation at molecular level.

2. Motivation experiment → Cognitive conflict (CC)

Pieces of natural rubber, plasticine and "Bouncing Putty" are pulled apart a) quickly and b) slowly

"Bouncing Putty" behaves like a) plasticine and b) natural rubber.

How come?

3. Further experiments and information to resolve CC

Experiments on "Bouncing Putty" (blow with hammer, bouncing ball, melting ball).

Molecular models for thermoplastics, thermosets and elastomers.

4. Explanation of the viscoelasticity of "Bouncing Putty"

Molecular structure and molecular interactions in the "Bouncing Putty" (with boron-doped polydimethylsiloxane) on a) slow and b) rapid application of force.

Nucleophilic substitution at the Si atom

Structure of a teaching module

1. Finding out what the pupils already know

Pupils' knowledge of nucleophilic substitution S_N at the C atom is established and activated (heterolytic mechanism in S_N, applications of S_N).

2. Goal setting

Is S_N of halogen atoms, including Si-X bonds, the same as it is in C-X bonds? Is it faster or slower? What products are formed?

3. Experiments to resolve the problem

Hydrolyses of chloromethylsilanes $(CH_3)_{4-x}SiCl_x$ are performed (teacher experiments!)
Results are compared with each other and with results from other S_N.

4. Explanation of experimental results, applications

Explanation of the greater reactivity of Si-X over C-X toward the nucleophile water.
Condensation of silanols from the S_N to dimethylsiloxanes and polymethylsiloxanes (silicones).