

Design, synthesis and application of self-organized systems based on coordination polymers and SAMs

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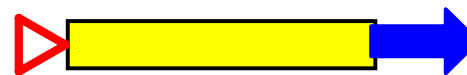
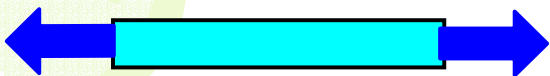
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Idea:

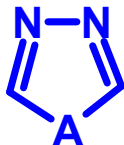
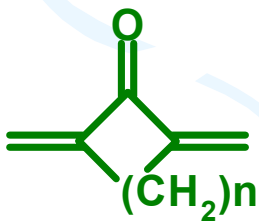
using non-covalent interactions in creating self-assembled systems capable of exhibiting one or several **useful properties**

- **Catalysis**
- **Porous structures, synthetic zeolites**
- **Conductivity**
- **Luminescence**
- **Magnetism**
- **Non-linear optics**
- **Redox systems**
- **Photochemistry**

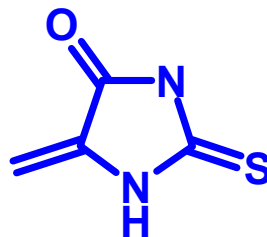
LIGAND DESIGN



spacers, such as:



donating units,
such as:



sulfur-containing
"clue", such as:

S-H

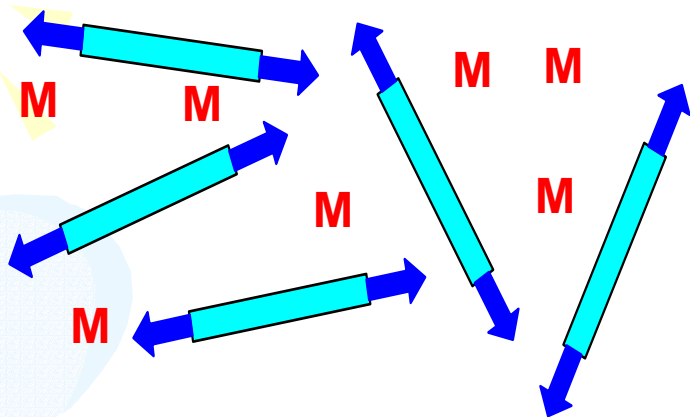
S-R

S-S

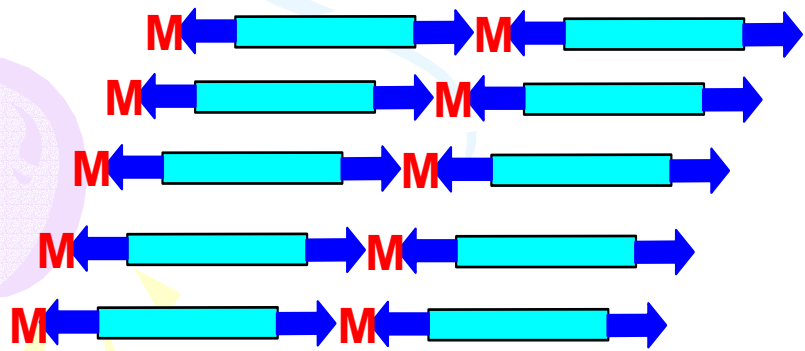
SELF-ORGANISED SYSTEM SYNTHESIS

Coordination polymers

CP

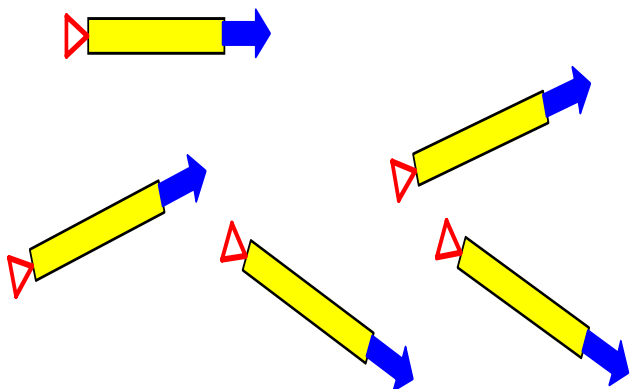


crystallisation - self-organisation

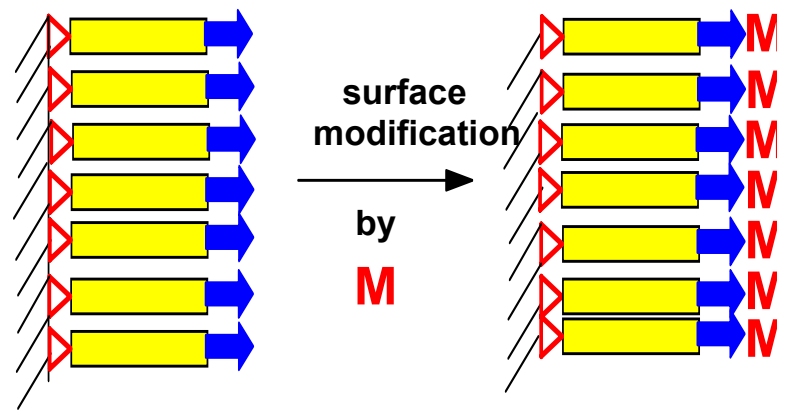


Self-Assembled Monolayers

SAM



interaction with surface - self-assembling



STUDIES OF APPLIED PROPERTIES

- **Catalysis (+ electrocatalysis and biocatalysis)** CP, SAM
- **Porous structures, synthetic zeolites** CP
- **Conductivity** CP, SAM
- **Luminescence** CP, SAM
- **Magnetism** CP
- **Non-linear optics** CP
- **Redox systems** CP, SAM
- **Photochemistry** CP, SAM



PROPOSED RESULTS

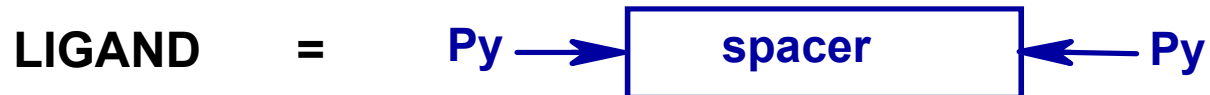
Coordination Polymers

- **new catalytic, photochromic, conductive, magnetic materials...**

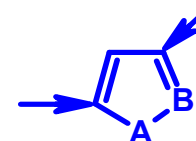
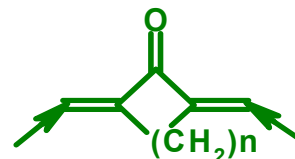
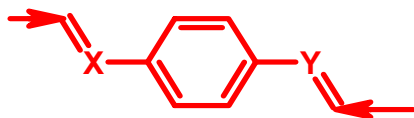
Self-Assembled Monolayers

- **new ion-selective electrodes, electrocatalytic materials...**

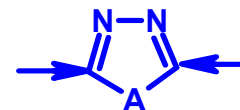
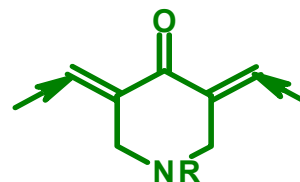
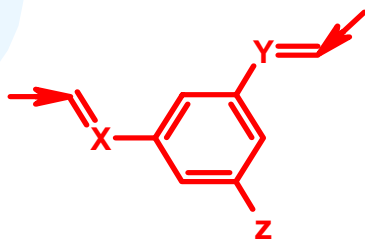
LIGAND DESIGN



where spacer is

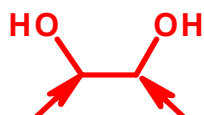
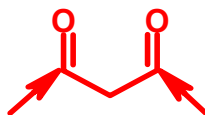
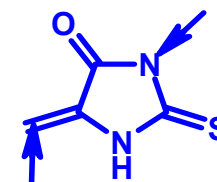
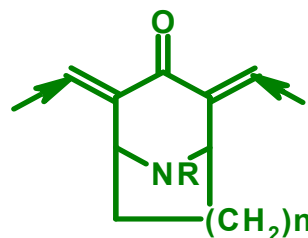


A = NH, B = CH
A = NH, B = N
A = O, B = N



A = NH, O

X, Y = CH₂, N;
Z = H, NO₂, NH₂, R, OR

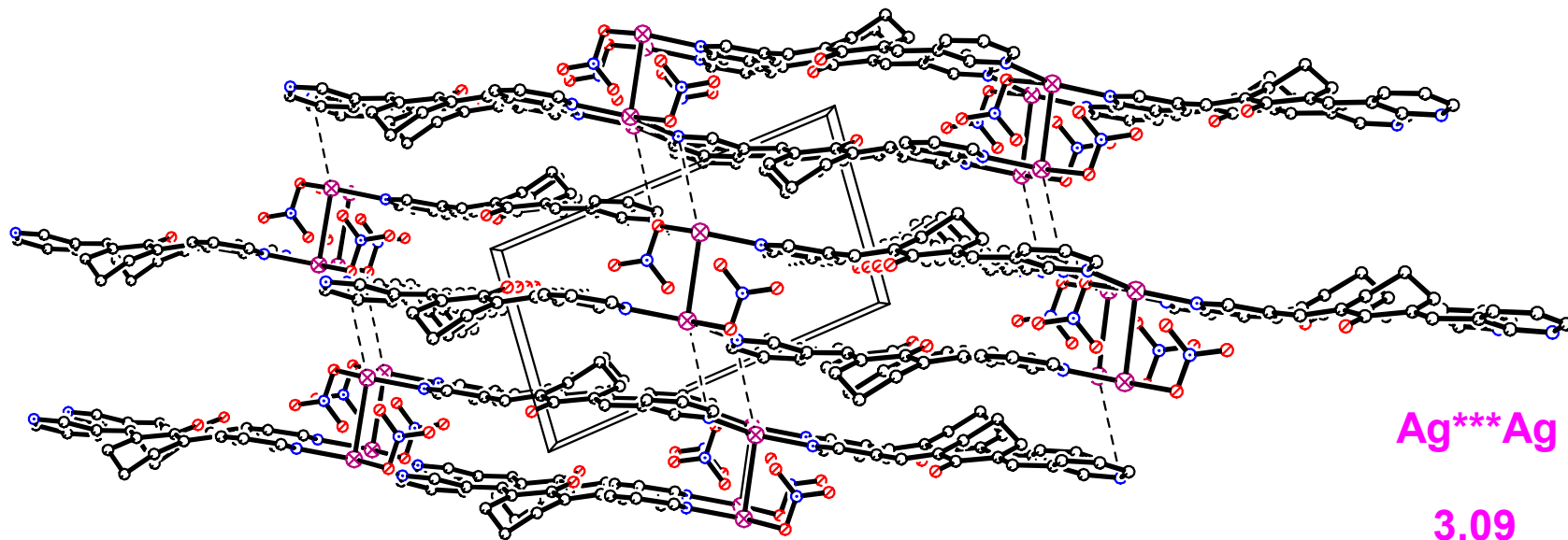
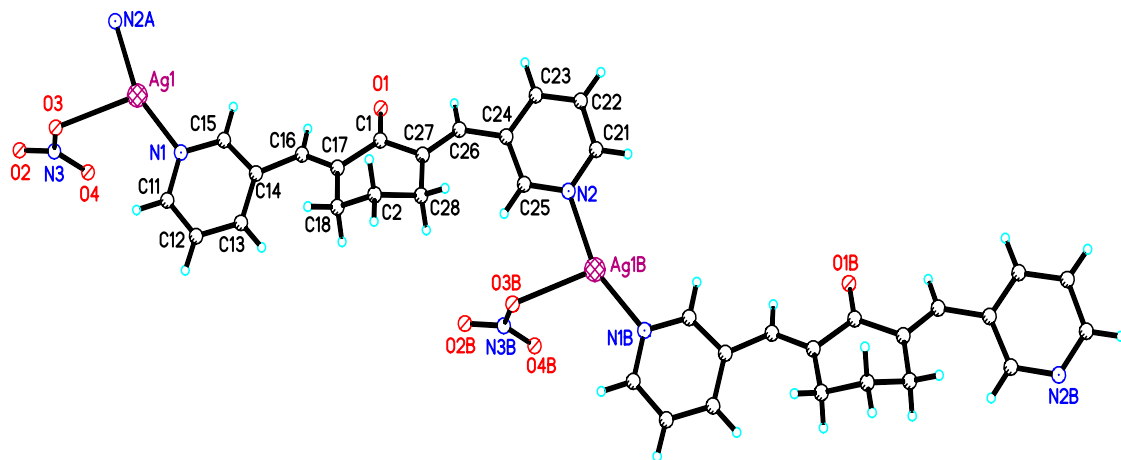
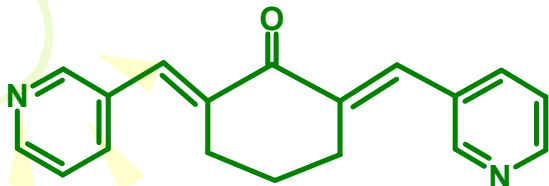


•Type A

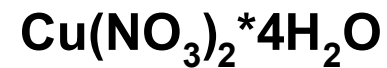
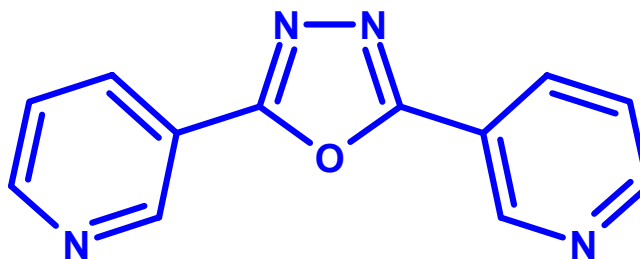
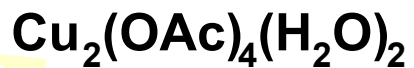
•Type C

•Type B

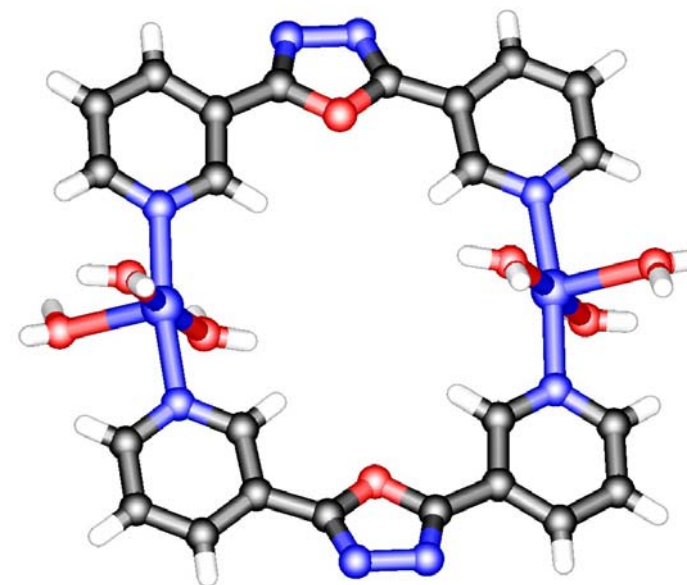
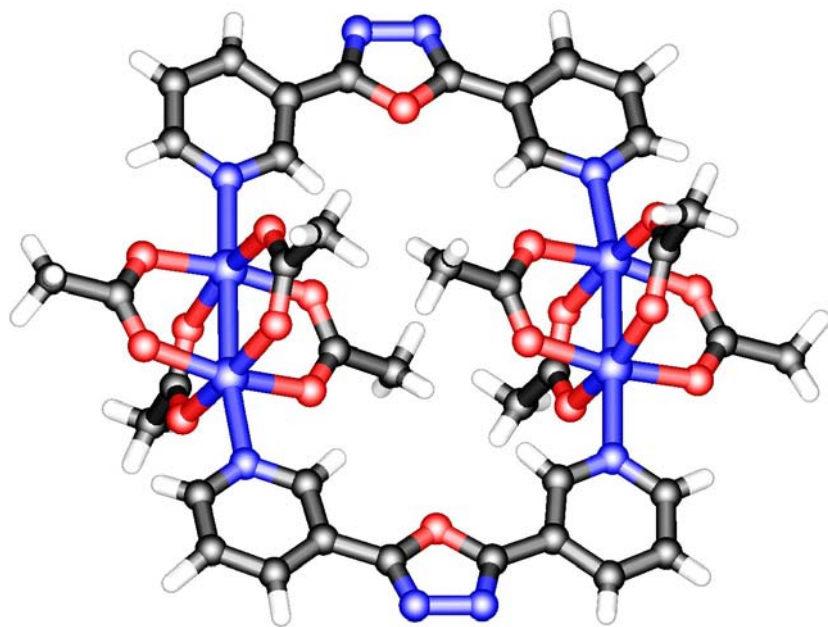
• Structure of complexes with Type C ligands



•Magnetic complexes with Type B ligands



EtOH / H_2O





CPs and SAMs will provide new materials for numerous applications:


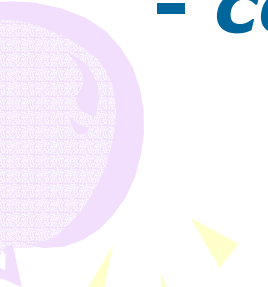
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- **Porous structures, synthetic zeolites**
- **Conductivity**
- **Luminescence**
- **Magnetism**
- **Non-linear optics**
- **Redox systems**
- **Photochemistry**
- **Molecular level devices and machines**

What makes our approach unique?

- **Rational design of products**
we know what we need
- **Reach experience in organic synthesis**
we can do what we need
- **Simple organic procedures and cheap starting materials-** *we save time and money*
- **Self-designed synthesis of CPs and SAMs –**
our know-how
- **Combining efforts of organic, inorganic and material chemists-** *our collaborations*



Who would be interested?

- **Catalysts and zeolites – *oil refinement, hydrogen storage***
 - **Ion-selective electrodes – *analytical equipment***
 - **Molecular electronics and magnetism – *computer production***
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- **Dr. Sergey Z. Vatsadze**

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