Keynote Lectures

**KN06**

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**Crystalline molecular flasks**

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Since our first report on a zeolite-mimic coordination network in 1994,[1] we have developed several robust coordination network complexes possessing large pores.[2-8] In some cases, the pore channels facilitate increased mobility and rapid diffusion of included guest molecules. Large organic molecules can easily enter into the pores via guest exchange. In this sense, the pore interior is a pseudo-solution state where chemical reactions may proceed as in a solution, yet can be directly analyzed by crystallography. Here, we show that single-crystal-to-single-crystal chemical reactions with large, common reagents proceed quite smoothly inside the pores of the network.[9] Taking advantage of the network’s robust crystallinity, we succeeded in the acylation and ureidation of aromatic amines and imine formation from aromatic aldehydes within a single crystal. The pores of the network complexes thus serve as “crystalline molecular flasks”. We also show a hemiaminal, a transient short-lived intermediate in the Schiff-base formation, can be trapped and directly observed by X-ray analysis in the crystalline molecular flasks.[10]


**Keywords:** inclusion, reaction, coordination

**KN08**

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**Use of external fields in the melt growth of semiconductors**

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Stationary and non-stationary magnetic fields have been widely applied for the melt growth of semiconductors in order to control the convection within the crucibles. Indeed when scaling up to industrial equipments, with melt masses above 200 Kg, the relatively large thermal gradients within the crucibles result in strong convective flows which ultimately degrade the quality of the semiconductor crystals. In some cases, under very unfavorable conditions, even onset of turbulence was observed. Pronounced striations, incorporation of undesired impurities coming from the crucible/ambient and doping non-uniformity are the typical defects. In standard experimental setups, such as Czochralski or Bridgman furnaces, the magnetic fields provided by one or more electromagnetic coil(s) placed around the growth chamber, in correspondence of the crucible position, may effectively damp the convective motion. However, although capable of reducing the convection of the melt, this type of setup has hardly met the expectations of academic and industrial crystal growers due to the cost of the magnet(s) and the high energy consumption. As a matter of fact the use of magnetic fields has so far been treated almost as a laboratory curiosity. Just in the case of very large melt amounts (typically CZ growth of silicon), where the elevated Rayleigh number leads to strong turbulence and negatively impacts the single crystal growth, the magnetic field found practical application.

At IKZ, in the frame of the KristMAG® consortium, an alternative approach was developed. In this case the resistive heaters of two CZ pullers and one VGF furnace were substantially modified in order to simultaneously provide heat and magnetic field to the melt [1, 2]. This is possible by adopting a spiral configuration for the graphite heaters and by simultaneously feeding these coils with DC and AC currents. The DC current essentially determines the temperature set point, whereas the AC signal provides a so-called travelling magnetic