**Recent Developments in the Chemistry of Aromatic Phosphorus Heterocycles:**

**From Fundamental Aspects to Applications**

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Low-coordinate phosphorus compounds have recently regained noticeable interest as the very peculiar stereoelectronic and coordination properties of such λ3σ2-species differ significantly from classical trivalent λ3σ3-phosphanes. These special characteristics can have interesting effects in applications, such as homogeneous catalysis or material science.

Due to a modular synthetic approach, we have lately demonstrated the access to various donor-functionalized 2,4,6-triaryl-λ3-phosphinines (phosphabenzenes, type A, Figure 1), including phosphorus derivatives of 2,2’-bipyridine and terpyridine. By making use of the chelate effect, we could demonstrate for the first time that neutral P,N and anionic P,C hybrid ligands form easily coordination compounds with transition metal centers in both low as well as medium to high oxidation states, which is an important aspect for applications in more applied research fields.



**Figure 1**. Phosphinine (**A**) and triazaphosphole (**B**) and comparison with their nitrogen-analogues.

Inspired by these findings, we started to investigate also other classes of functionalized, low-coordinate phosphorus compounds. We anticipated that derivatives of 3*H*-1,2,3,4-triazaphospholes (type B, figure 2) are suitable candidates, as they can generally be prepared in a modular “click”-reaction, starting from azides and phosphaalkynes. First results show indeed, that this powerful tool can be used as well for the straightforward and simple preparation of donor-substituted, chelating triazaphospholes.

This lecture will focus on the design and preparation of especially pyridyl-functionalized phosphinines and triazaphospholes. The access to such compounds provides new perspectives for areas of chemical research, which are otherwise dominated by transition metal complexes based on pyridine-, bipyridine- and terpyridine-based ligands. A detailed comparison of the here-presented low-coordinate phosphorus compounds with their structurally related nitrogen-counterparts, having an identical substitution pattern, will be provided.