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## *COST ACTION GREENERING – DATA COLLECTION*

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<b>Type (Academic or Industrial):</b>	<b>Academic</b>
<b>Country:</b>	Estonia
<b>Leadership position in the COST:</b>	WG4 co-leader
<b>Working Group in which you are involved:</b>	WG1, WG4
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### **Laboratory/Company:**

Department of Chemistry and Biotechnology  
Tallinn University of Technology  
12618 Tallinn, Estonia

### **Laboratory/Company info:**

Our group transcends its knowledge in synthetic chemistry to molecularly design and test so-termed networked molecules. These are a subset of multifunctional small-molecular-weight compounds that address the notions of chemical as well as biological networks. In particular, we employ our tailored ‘networked molecules’ to

1. rationally build up well-organized molecular networks and successfully use them as electrocatalyst/heterogenous catalyst materials for various applications, incl. renewable energy and ‘ligandless’ catalysis;
2. disrupt and/or rewire biological networks with a goal of inducing new intracellular interactions and observing synergistic effects.

Such entities in their simplest form are heterobivalent constructs, however, we are looking to install additional moieties that would help extend their multifold performance.

### **Link to the home page of the Laboratory/Company:**

<https://starkov.group>

### **Fields of expertise:**

- Development and discovery of heterobifunctional and multifunctional constructs for applications as new tools in medicinal chemistry and chemical biology
- Development of heterobifunctional and multifunctional constructs for applications in materials chemistry, especially heterogeneous catalysis, electrocatalysis and separation.

### **5 Main publications or patents:**

- Ping, K.; Alam, M.; Kahnert, S. R.; Bhadoria, R.; Mere, A.; Mikli, V.; Käärrik, M.; Aruväli, J.; Paiste, P.; Kikas, A.; Kisand, V.; Järving, I.; Leis, J.; Kongi, N.\*; Starkov, P.\* Multi-purpose chemo- and electrocatalyst material from an amorphous cobalt



metal–organic framework. *Mater. Adv.* **2021**, 2, 4009–4015. DOI:10.1039/D1MA00414J

- Kazimova, N.; Ping, K.; Alam, M.; Danilson, M.; Merisalu, K.; Käärrik, M.; Mikli, V.; Aruväli, J.; Paiste, P.; Leis, J.; Tammeveski, K.; Starkov, P.;\* Kongi, N.\* Shungite-derived graphene as a carbon support for bifunctional oxygen electrocatalysts. *J. Catal.* **2021**, 395, 178–187. DOI:10.1016/j.jcat.2021.01.004
- Bhadoria, R.; Ping, K.; Lohk, C.; Järving, I.; Starkov, P.\* A phenotypic approach to probing cellular outcomes using heterobivalent constructs. *Chem. Commun.* **2020**, 56, 4216–4219. DOI:10.1039/C9CC09595K
- Ping, K.; Braschinsky, A.; Alam, M.; Bhadoria, R.; Mihkli, V.; Mere, A.; Aruväli, J.; Paiste, P.; Vlassov, S.; Kook, M.; Rähn, M.; Sammelselg, K.; Tammeveski, K.; Kongi, N.;\* Starkov, P.\* Fused hybrid linkers for metal–organic framework-derived bifunctional oxygen electrocatalysts. *ACS Appl. Energy Mater.* **2020**, 3, 152–157. DOI:10.1021/acsaem.9b02039
- Ping, K.; Alam, M.; Käärrik, M.; Leis, J.; Kongi, N.; Järving, I.; Starkov, P.\* Surveying iron–organic framework TAL-1 derived materials in ligandless heterogenous oxidative catalytic transformations of alkylarenes. *Synlett* **2019**, 30, 1536–1540. DOI:10.1055/s-0037-1611877 [Invited]

#### Collaborations:

- Proj J Hofkens (KU Leuven, BE)
- Prof J Solla-Gullón (Univ of Alicante, ES)
- Prof N Kongi (Univ of Tartu, EE)
- RedoxNRG OÜ (Narva, EE)

#### Facilities:

- Materials chemistry and characterization: SEM, HRTEM, STEM, XPS, XRD, Raman, ICP-MS, AES-MS
- Cell culture and biochemistry (GC/MS)
- Organic synthesis and characterization (incl. solid state <sup>13</sup>C NMR, CD, HRMS)
- Molecular imaging (confocal, STED, inverted, TIRF)