

## Report on the EU COST action CM1203 Workgroup 1 workshop

at Ulm University, held Friday, July 31<sup>st</sup> 2015

Report produced by the local organizer, Carsten Streb, Ulm University

Date of report: 15.09.2015

### 1. Workshop participants and affiliation:

1	Prof. Dr. Benjamin Dietzek	Univ. Jena	CM1202
2	Prof. Dr. Sven Rau	Univ. Ulm	CM1202
3	Dr. Richard Villanneau (Proust group)	Universite Pierre et Marie Curie	CM1202/CM1203
4	Prof. Dr. Ulrich Kortz (or representative)	Jacobs University Bremen	CM1203
5	Dr. Rene More (Patzke group)	Univ. Zuerich	CM1203
6	Prof. Dr. Carsten Streb	Univ. Ulm	CM1202/CM1203
7	Dr. Concha Bosch Navarro	University of Warwick	CM1203
8	Dr Andrea Sartorel (Bonchio group)	Univ Padova	CM1203
9	Prof. Dr. José Ramon Galan Mascaros	ICIQ	CM1203
10	Prof. Dr. Pawel Kuleszka	University of Warzaw	CM1203
11	Dr. Graham Newton	Univ. Tsukuba / U Nottingham	CM1203
12	Dr. Jordi Carbo (Poblet group)	Univ. Rovira i Virgili	CM1203
13	Lucie Teillout (de Oliveira group)	Univ Paris Sud	CM1203
14	Prof. Ira Weinstock	Ben-Gurion Univ of the Negev	CM1203
15	Dr. John Errington	Univ. of Newcastle	CM1203
16	Dr. Scott Mitchell	Univ. Tarragona	CM1203
17	Dr. Zois Syrgiannis	CNR Padova	CM1203
18	Dr. Jenny Zhang (Reisner group)	Cambridge Univ	CM1202
19	Prof. Antoni Llobet	ICIQ	CM1202

### 2. Workshop timetable

Time	Topic	Speaker
08.45-09.00	Arrival, Ulm University, N25, 2.103	
09.00-09.05	Welcome to Ulm	C. Streb
09.05-09.15	Welcome to CM1203/CM1202	J. Errington / B. Dietzek
09.15-10.30	Introduction round	Everyone
10.30-10.45	Coffee / informal discussions	
10.45-11.00	Topic 1: Water splitting-trends	C. Streb
11.00-11.45	Round-table discussion: Future trends for POM water splitting	Everyone

11.45-12.30	Lunch	
12.30-12.45	Topic 2: POM-based CO <sub>2</sub> -activation	G. Newton
12.45-13.30	Round-table discussion: Future trends for POM CO <sub>2</sub> activation	Everyone
13.30-13.45	Coffee / informal discussions	
13.45-14.00	Topic 3: POM-metal nanoparticle assemblies	S. Mitchell
14.00-14.45	Round-table discussion: Future trends for POM nanoparticles	Everyone
14.45-15.00	Coffee / informal discussions	
15.00-16.45	Small group meetings and project discussions	Everyone
16.45-17.00	Concluding remarks and future planning	John Errington / C. Streb
17.00 - 18.30	Informal meeting time	
19.00-22.00	Dinner in Ulm town centre	

### 3. Discussion outcomes and future collaborations

#### Topic 1: POM-based water oxidation:

The following main points were discussed for POM-based water oxidation catalysts:

Currently, more mechanistic understanding is required to understand catalytic performance, stability and activity limiting steps, reactive sites etc.

Expansion of the current systems towards unconventional POM structures could lead to new reactivity, stability etc.

Referees in POM-WOC research need to be vigilant about reports where unfounded/non-proven mechanisms are proposed or presented as fact.

International funding opportunities need to be sought to strengthen the EU collaborations on POM-WOC research, particularly in the areas of catalytic mechanism, cluster stability and full systems analysis (i.e. catalyst, photosensitizer, etc.)

Future work should be focused on deposition methods to link POMs to (photo)electrodes to further the device integration of POMs.

Closer collaboration between COST actions CM1202 and CM1203 is required.

#### Topic 2: POM-based CO<sub>2</sub> activation:

The following main points were discussed for POM-based reductive CO<sub>2</sub> activation:

Currently, only limited research is reported on POM-CO<sub>2</sub> activation

Future systems could use POMs for proton and electron storage and transport, thus reducing the energy barriers related to photochemical or electrochemical CO<sub>2</sub> multi-electron reduction.

New POM compounds need to be screened to identify promising systems for CO<sub>2</sub> activation

Coupling of POMs to other reactive species could be used to modulate reactivity towards CO<sub>2</sub>.

### **Topic 3: POM-metal nanoparticle composites:**

The following main points were discussed for POM-metal nanoparticle composites:

Current studies are focused on the use of POMs as surface active groups to tune the structure and electronic properties, mainly of noble metal (Au, Ag) nanoparticles.

POMs and metal NPs might have synergistic properties in the areas of electrochemistry, energy conversion/storage and bio-medicine.

Tethering POMs to metal NPs could be a useful route to employ the redox-activity of POMs.

Organo-functionalized POMs might be suitable candidates for tethering to metal NPs through suitable linkage groups (thiols, pyridine, etc.)

Future collaborations should move from POM-NP synthesis to materials deployment in the focus areas of this COST action and beyond.