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Synthesis, characterization and applications of Polyoxometalate-based Ionic Liquids

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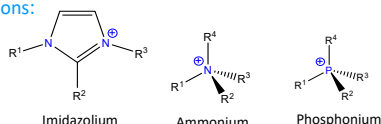
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In the context of sustainable chemistry, Ionic Liquids (ILs) were among the first "green" solvents used. A wide variety of ILs exists, including polyoxometalate(POM)-based ILs¹ usually used as catalysts in desulfurization of fuels² and oxidation reactions³ or in depollution⁴. Herein, synthesis and characterization of a new POM-based ILs and its application in oxidation catalysis of organic molecules are presented.

Ionic Liquids (ILs) mp < 100°C

Cations:



Anions:

Organic

MsO⁻, TsO⁻, CH₃CO₂⁻ ...

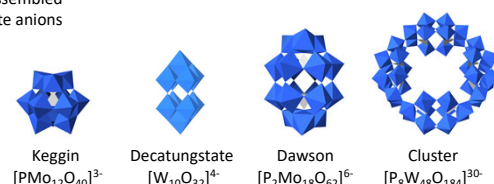
Inorganic

Cl⁻, Br⁻, BF₄⁻, PF₆⁻, ClO₄⁻ ...

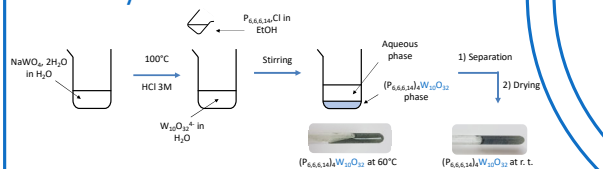
- High stability (thermal and chemical)
- Low vapor pressure (at r. t.)
- High conductivity
- Recyclability

- Soluble polynuclear anionic metal oxide
- Composed of metals in their highest oxidation state (W or Mo)
- MO₆ octahedra assembled around template anions

Polyoxometalates (POMs)



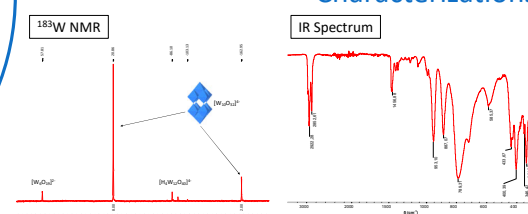
POM-IL synthesis



POM-IL

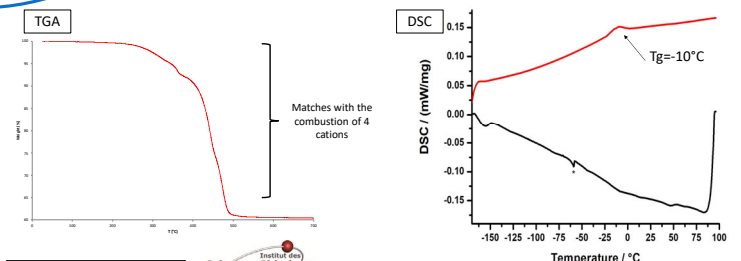
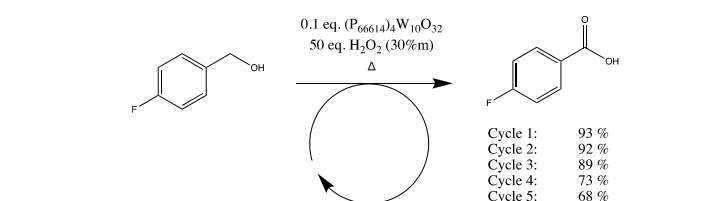
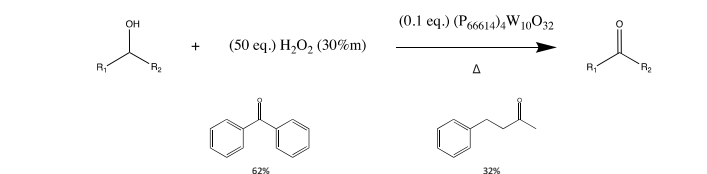
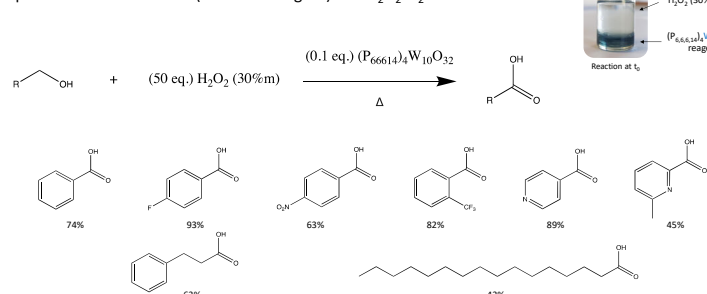
(P_{6,6,6,14})₄W₁₀O₃₂

Characterizations

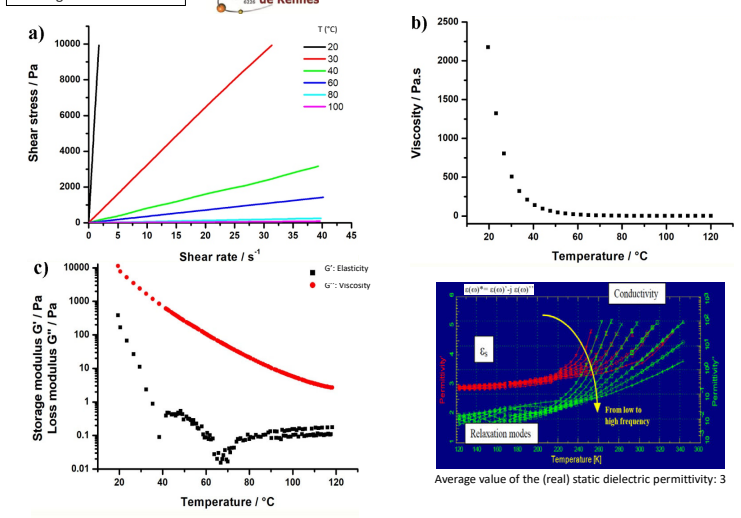


Alcohols oxidation

Biphasic reaction between (POM-IL + reagent) and H₂O₂-H₂O



Rheological measurements



All of these analyses confirm the formation of (P_{6,6,6,14})₄W₁₀O₃₂ and its good solvent and ionic liquid properties

In conclusion, the accurate choice of cations coupled with POMs allows the creation of ionic liquids. The features of the resulting POM-IL are improved thanks to the oxidative property of the POM and solvent nature of the IL.

- Perspectives:
- Oxidation of other organic molecules
 - Reaction mechanism study
 - Scope of POM-IL
 - UV-Visible oxidation reaction

References: [1] Nancy Watfa, Sébastien Floquet et al., Soft Matter, **2015**, 11, 1087-1099
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