Ionic Liquids: Alternative Solvents for Catalysis and Separations

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Outline

- The chemistry
- The Role of SMU-ILO / TTO
- The Role of GCC
- Where to now?

Green Chemistry

- the utilization of set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products.

Green Chemistry – Theory and Practice, P. T. Anastas & J. C. Warner, Oxford, 1998

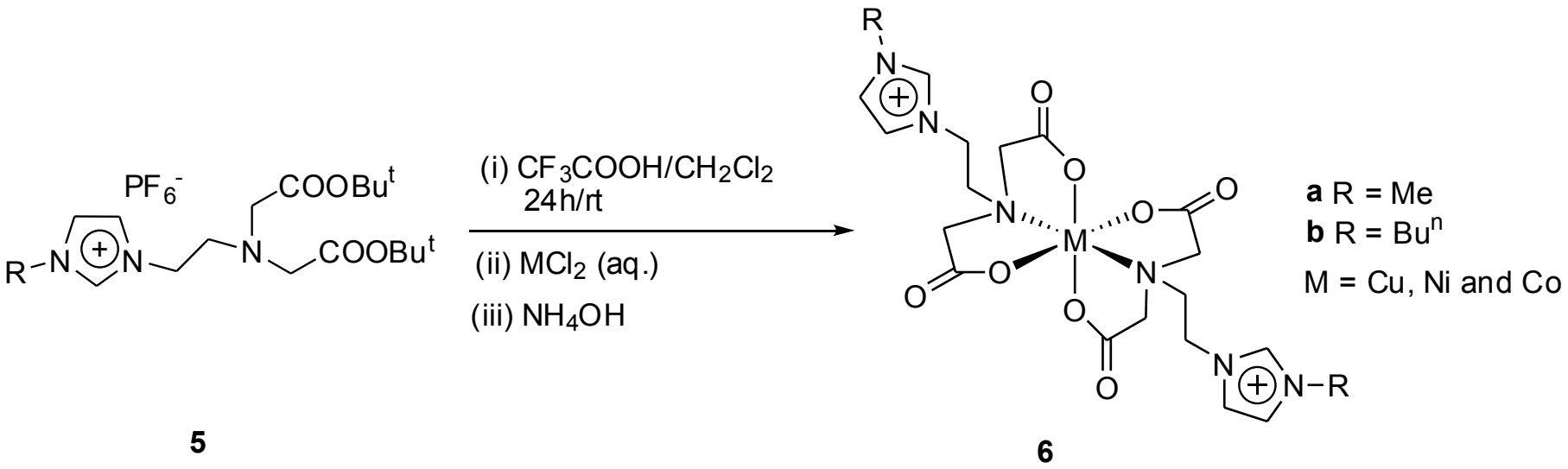
Green Chemistry

12 Principles of *Green Chemistry*

(1) Prevent Waste
(2) Atom Economy
(3) Less Hazardous Chemical Synthesis
(4) Designing Safer Chemicals
(5) Safer Solvents and Auxiliaries
(6) Design for Energy Efficiency
(7) Use of Renewable Feedstocks
(8) Reduce Derivatives
(9) Catalysis
(10) Design for Degradation
(11) Real-time Analysis for Pollution Prevention
(12) Inherently Safer Chemistry for Accident Prevention

Chelating TSILs

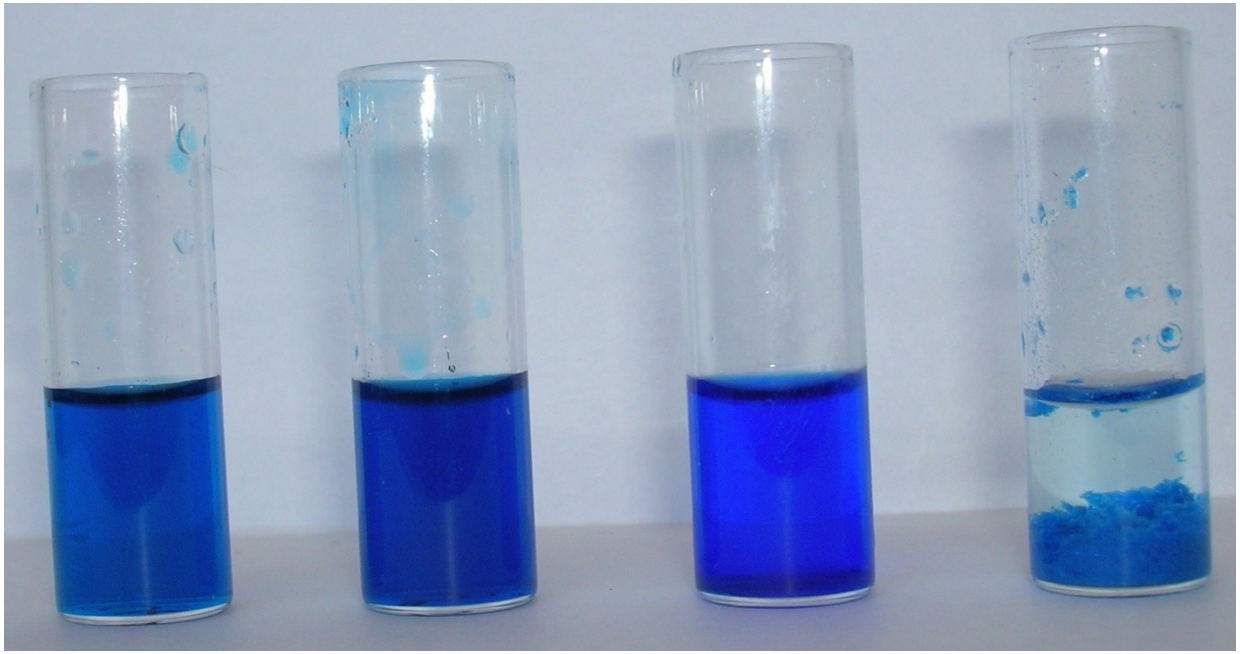
1st Generation -Separations

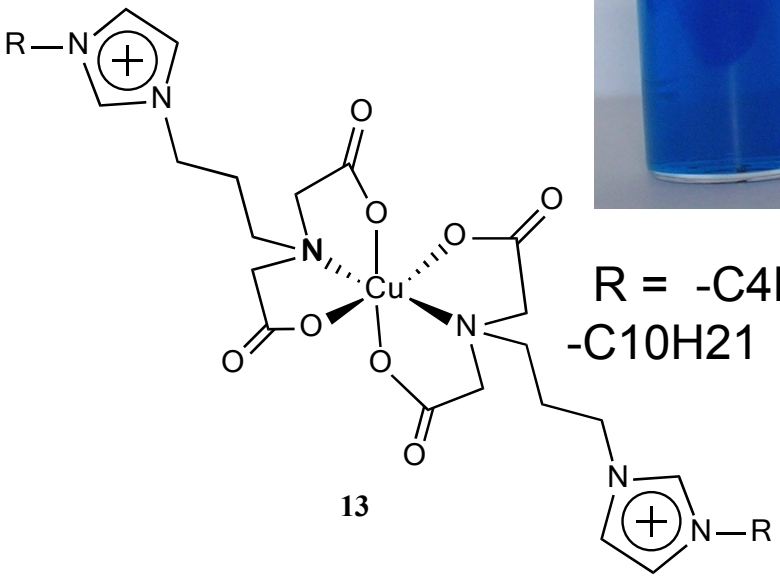


5 **6**

(a) *US Provisional Patent Application Number 60/752,880* **2005**.
(b) *Dalton Trans.* **2008**, 4595 – 4601.
(c) *Inorg. Chem.* **2006**; *45*(25); 10025-10027.

Water solubility of Cu[PDACnim]2





13

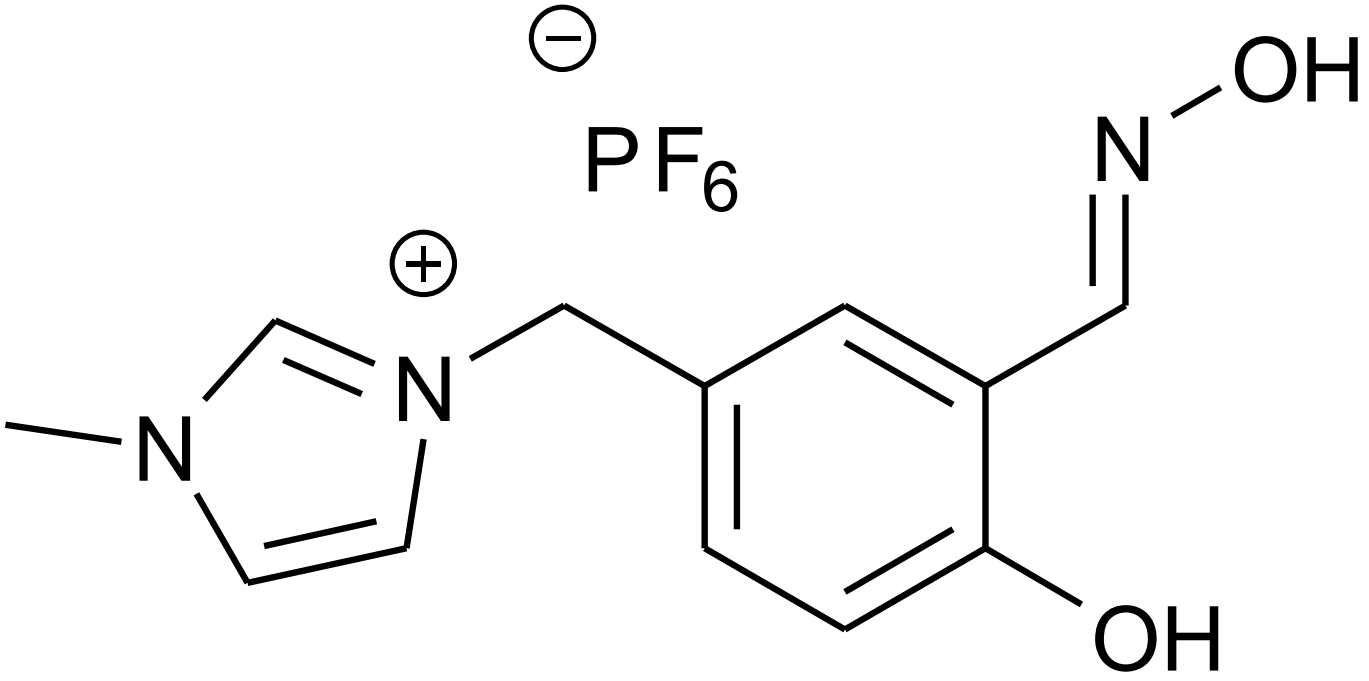
R = -C4H9 -C6H13 -C8H17 -C10H21

Ratio of concentrations of Cu(II) in sample solution to the control solution using 1st Gen.

Copper complex derived from	**Cn**	*Kn* ([Cu2+] / [Cu2+]o)
13a	C4	**0.986**
13b	C6	**0.652**
13c	C8	**0.194**
13d	**C10**	**0.071**

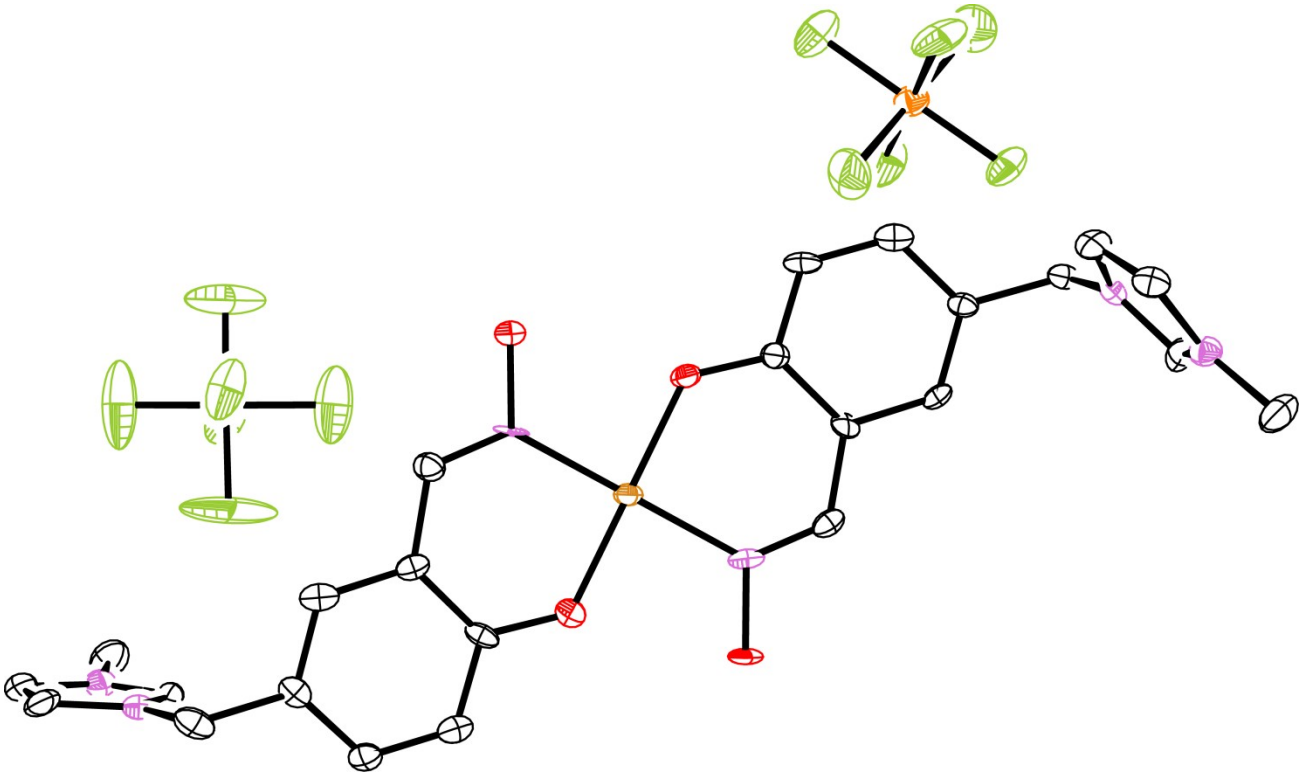
Chelating TSILs

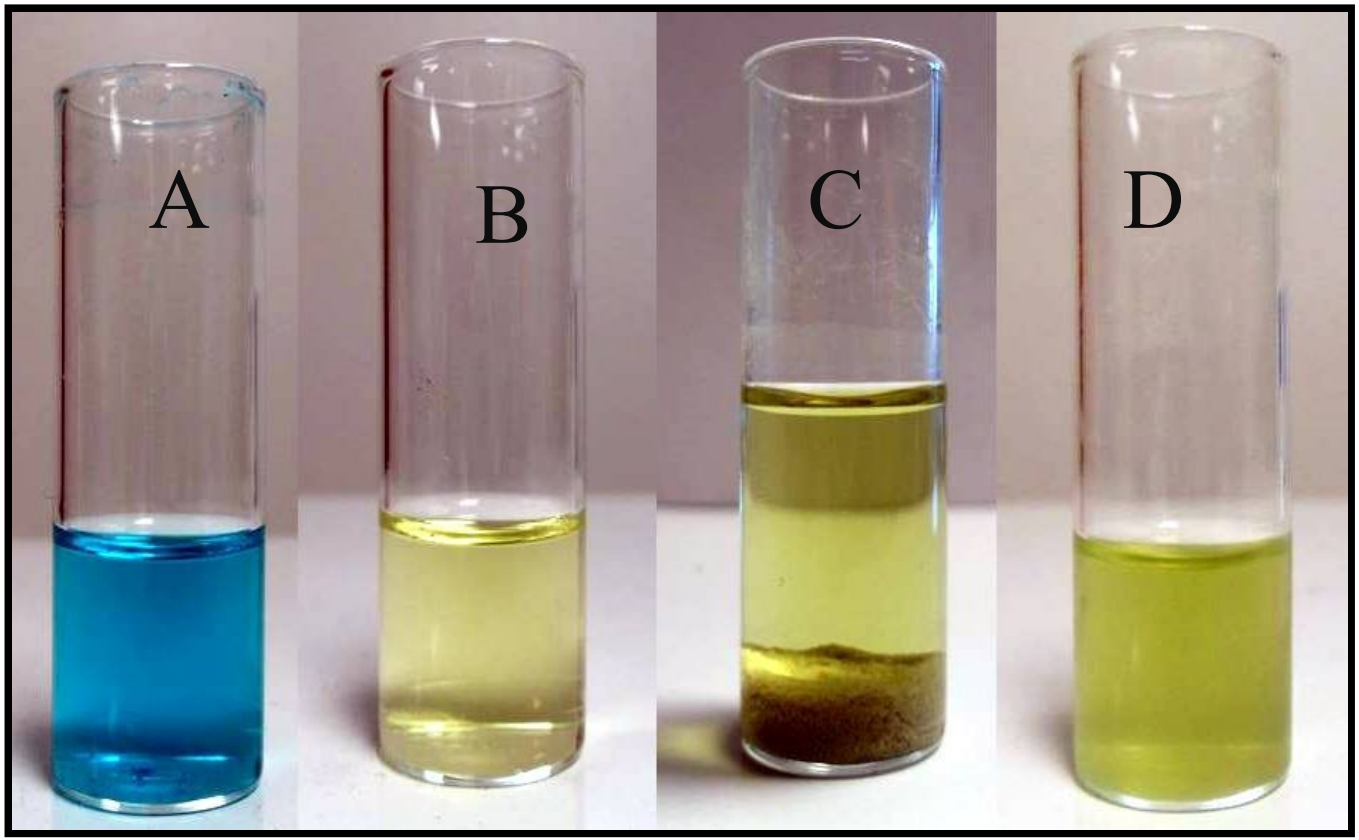
2nd Generation -Separations



- Robert D. Singer and Prashant Upendra Naik U.S. Pat. Appl. Publ. (2010) US 20100324273 A1 20101223
- Prashant Naik and Robert D. Singer PCT Int. Appl. , PCT/CA2009/000229; **WO 2009/105881**.
- Prashant Naik and Robert D. Singer Provisional Patent filed in US Patent and Trademark Office (USPTO), Appl.#: **61/032,103**.
- Prashant U. Naik, Greg McManus, Michael J. Zaworotko and Robert D. Singer* *Dalton Trans.* **2008**, 4834 – 4836.

Bis(IL-oxime)-Cu(II), **17**.




A
B
C
D

Ratio of concentrations of Cu(II) in sample solution to the control solution using 2nd Gen.

Copper complex derived from	*Kn (lab)* ([Cu2+] / [Cu2+]o)	*Kn (real)* ([Cu2+] / [Cu2+]o)
20a	**0.011**	**0.757**
20b	**0.002**	**0.118**

Partnership Benefits

Paper strategy	Saint Mary's TTO	Green Center Canada
Assess Technology		Pre-screen
Performance testing		POP
Apply for US provisional	Springboard POC/PL fund	
Access additional funding		Industry Input/detailed report
Seek Industry partner	Industrial/NSERC Fund	Intermediary
License Technology		Intermediary/Industry Partner
Scale up demonstration etc.	Industry engagement	

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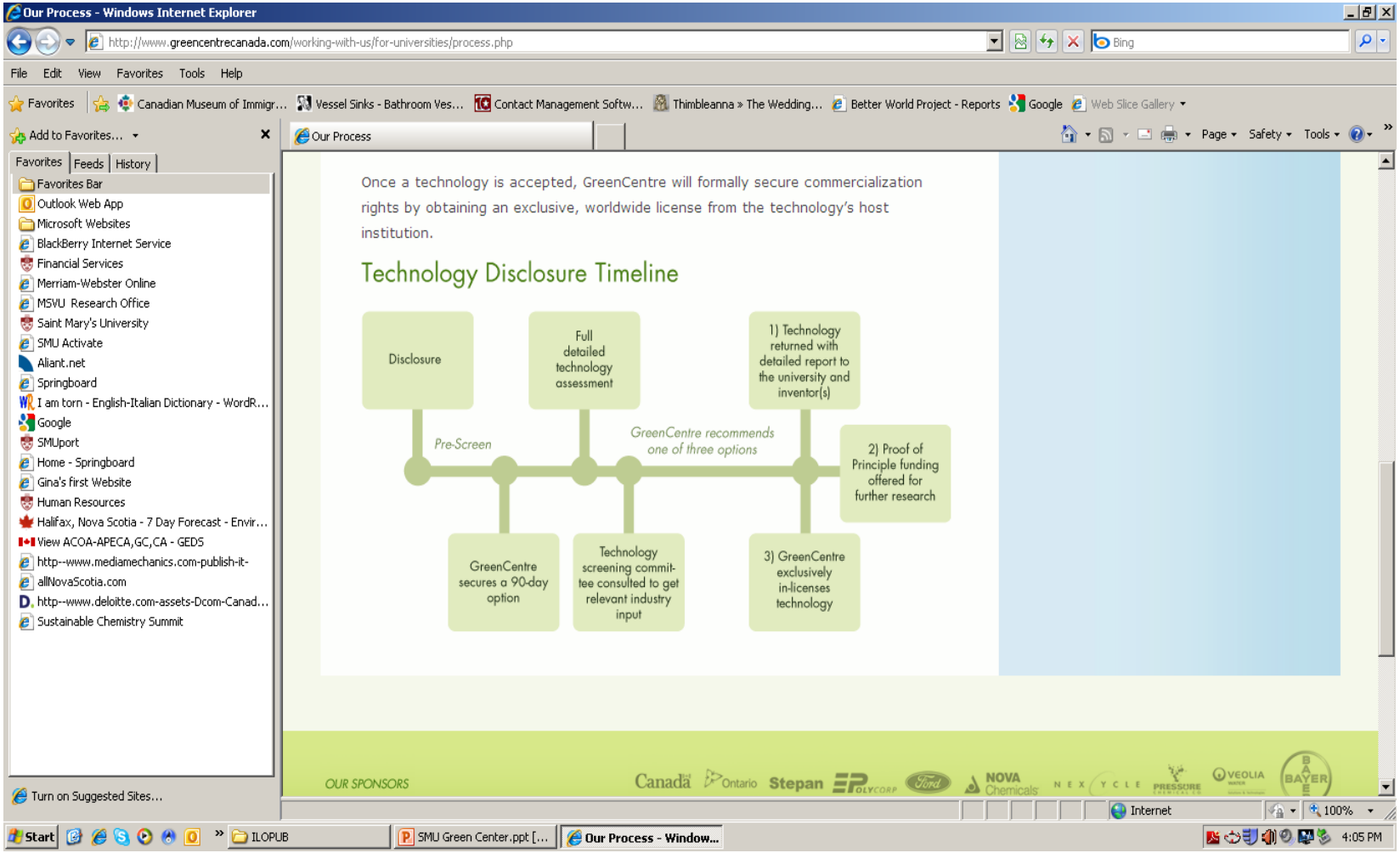
A model that works!



Leveraged funding

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- **$ 10 000** Springboard Atlantic – Patent and Legal Fund
- **$ 20 000** NS-OED / Innovacorp - Early Commercialization Fund – postdoc funding
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- Saint Mary's University
- Pfizer Global R & D

NSERC CRSNG

LIGNOWORKS

Springboard

GreenCentre Canada

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Thank you

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