## Application Sheet io·li·tec



# **Ionic Liquids for Synthesis and Stabilization of Nanoparticles**

Ionic liquids are interesting, innovative media for the synthesis of a wide variety of inorganic materials and compounds. The combination of low vapour pressure with liquidity over wide range of temperatures and their good dissolution behaviour in general make them ideal solvents for this increasingly important application, especially in view of nanoscaled materials synthesis. In addition, they often have a pre-organized structure, they have an intrinsic charge and they are polarizible. These properties enable them to control size, size-distribution and shape of nano-scaled materials. In summary, the concept of "designer solvents" became true for inorganic synthesis, in particular.<sup>[1-3]</sup>

#### **Selected Examples:**

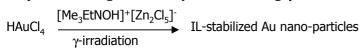
• Microwave-assisted synthesis of luminescent LaPO<sub>4</sub>:Ce,Tb nano-particles [4]

$$LaCl_{3}\cdot 6H_{2}O + CeCl_{3}\cdot 7H_{2}O + TbCl_{3}\cdot 6H_{2}O \xrightarrow{IL, EtOH} LaPO_{4}: Ce, Tb nano-crystals 1. H_{3}PO_{4}, IL, EtOH 2. Microwave, 800W, 10s, 300°C$$

#### • Synthesis of TiO<sub>2</sub> anatas nano-particles [5]

$$TiCl_4 \xrightarrow{[BMIM]^+[BF_4]^-} TiO_2 \text{ nano-particles}$$
Hydrolysis

### • Synthesis of gold nano-particles using $\gamma$ -irradiation [6]



Different sizes can be obtained depending on the co-solvent.



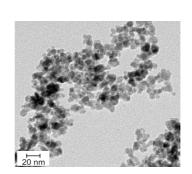
$$[Ir(cod)Cl]_2 \xrightarrow{ [BMIM]^+[PF_6]^- } Ir nano-particles$$

$$H_2$$

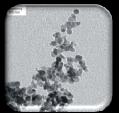
Product Code	Compound	Quantities
IL-0115-HP	1-Hexadecyl-3-methylimidazolium chloride, >98 %	25 g to bulk
IL-0012-HP	1-Butyl-3-methylimidazolium tetrafluoroborate, 99%	25 g to bulk
IL-0011-HP	1-Butyl-3-methylimidazolium hexafluorophosphate, 99%	25 g to bulk
IL-0117-HP	Tributylmethylammonium bis(trifluoromethyl-sulfonyl)imide, 99%	25 g to bulk
IN-0006-TG	Trihexyltetradecylphosphonium chloride, >95%	25 g to bulk
IL-0013-HP	1-Butyl-3-methylimidazolium triflate, 99%	25 g to bulk

#### **References:**

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- [2] Y. Zhou, Current Nanoscience 2005, 1, 35.
- [3] D-P. Liu, G-D. Li, Y. Su, J.-S. Chen, *Angew. Chem.* **2006**, *118*, 7530.
- [4] C. Feldmann, G. Bühler, Angew. Chem. 2006, 118, 4982.
- [5] Y. Zhou, M. Antonietti, J. Am. Chem. Soc. 2003, 125, 14960.
- [6] S. Chen, Y. Liu, G. Wu, Nanotechnology 2005, 16, 2360.
- [7] G.S. Fonseca, A.P. Umpierre, P.F.P. Fichtner, S. R. Teixeira, J. Dupont, Chem. Eur. J. 2003, 9, 3263.



















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