

Micelle Formation and Catalysis in Liquid Ammonia

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Perfluorinated long chain alkyl amides aggregate in liquid ammonia with increasing concentration which reflects micelle-type formation based on changes in ^{19}F NMR chemical shifts. The critical micelle concentrations (cmc) decrease with increasing chain length and give Klevens parameters $A = 0.18$ and $B = 0.19$. The micelles catalyse the ammonolysis of esters in liquid ammonia. The corresponding perfluorinated long chain alkyl carboxylates form ion-pairs in liquid ammonia but the equilibrium dissociation constants indicate favourable interactions between the chains in addition to the electrostatic forces. These perfluorinated carboxylates form micelles in aqueous solution and their cmc's generate a Klevens B-value = 0.52 compared with 0.30 for the analogous alkyl carboxylates. The differences in hydrophobicity of CH_2 and CF_2 units in water and liquid ammonia are discussed, as is the possible relevance to life forms in liquid ammonia. The solvolysis of triglycerides in liquid ammonia occurs by a stepwise conversion of the triester to diester to monoester to glycerol with one equivalent of carboxylic acid amide produced at each stage. Immobilised lipase B (CALB) is catalytically active in liquid ammonia and shows selectivity against triglycerides.

Sun, H.; Page, M. I.; Atherton, J. H.; Hall, A. *Catal. Sci. Technol.*, **2014**, *4*, 3870-3878

Ji, P.; Atherton, J. H.; Page, M. I.; Sun, H. *J. Phys. Org. Chem.*, **2013**, *26*, 1038-1043

Griffin, J.; Atherton, J. H.; Page, M. I., *J. Phys. Org. Chem.*, **2013**, *26*, 1032-1037

Ji, P.; Atherton, J. H.; Page, M. I. *Org. Biomol. Chem.*, **2012**, *10*, 7965-7969

Ji, P.; Atherton, J. H.; Page, M. I. *Org. Biomol. Chem.*, **2012**, *10*, 5732-5739

Ji, P.; Atherton, J. H.; Page, M. I. *J. Org. Chem.*, **2012**, *77*, 7471-7478

Ji, P.; Atherton, J. H.; Page, M. I. *Org. Biomol. Chem.*, **2012**, *10*, 7965-7969

Ji, P.; Atherton, J. H.; Page, M. I. *J. Org. Chem.*, **2011**, *76*, 1425-1435

Ji, P.; Atherton, J. H.; Page, M. I. *Org. Lett.*, **2011**, *13*, 6118-6121

Ji, P.; Atherton, J. H.; Page, M. I. *Faraday Discuss.*, **2010**, *145*, 15-25.