

By applying the Einstein-Smoluchowski relations to the dielectric spectra, diffusion coefficients are obtained ($D=\lambda^2\omega_c/2$) in quantitative agreement with independent PFG NMR measurements (Fig.2).

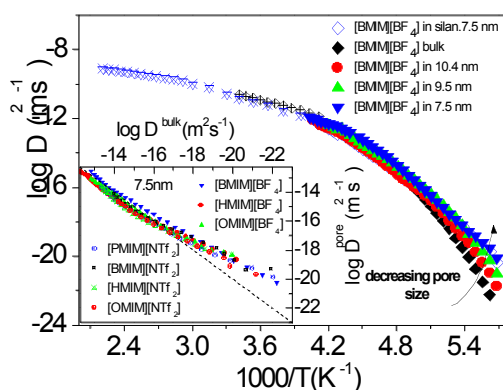


Fig.2 Diffusion coefficients determined by applying the Einstein-Smoluchowski equation to the dielectric spectra of BMIM BF_4 bulk and in different pore sizes. The crossed symbols represent the experimental diffusion coefficients using PFG NMR which are in a good agreement with BDS measurements. Inset: Diffusion coefficients of BF_4^- and NTf_2^- based ionic liquids in 7.5 nm silica nanopores versus bulk diffusion coefficients. Arbitrary dotted line represents 1:1 ratio between diffusion coefficients in pores and in bulk.

At higher temperatures, the diffusion coefficients of the confined and bulk ionic liquids are identical for all pore sizes while ILs are observed to diffuse faster in comparison to their bulk value at lower temperatures. The discussion is conducted with respect to the interplay between the dynamic glass transition and charge transport in ILs.

3. Conclusions

Charge transport in BF_4^- and NTf_2^- based imidazolium ILs which are physically confined into different nanopores is studied by a combination of BDS and PFG NMR. A systematic variation of the pore sizes (7.5nm, 9.5nm and 10.4nm) results in significant changes in the quantities corresponding to glassy dynamics and charge transport processes. Applying the Einstein-Smoluchowski relation to the dielectric spectra, diffusion coefficients in agreement with PFG NMR measurements are obtained. The results are discussed with respect to the ion-ion correlation responsible for changing in the density of ILs at lower temperatures.

4. References

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