

# Separation of collective and single-particle dynamics in a pyridinium-based ionic liquid by means of polarized neutrons

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The analysis of QENS-data measured on hydrogen-rich organic samples is usually started with the assumption that the incoherent signal from hydrogen determines the total scattering intensity, while the coherent contribution is considered to be negligible. On the other hand the static structure factor of many ionic liquids features so-called pre-peaks in the  $Q$ -range accessible normally by QENS; and thus this assumption for such kinds of samples is questionable. Here we report experiments on separation of collective and single-particle contributions of the total scattering intensity of [BuPy][Tf<sub>2</sub>N] (1-butylpyridinium bis(trifluoromethylsulfonyl)imide). The intensity of the coherent part, which describes collective dynamics, follows the static structure factor of the totally deuterated sample measured on the diffractometer HRPT at the Swiss spallation source SINQ. The quasielastic broadening of the coherent contribution corresponds to a slow collective motion on the timescale of several picoseconds. The incoherent intensity decreases monotonously with  $Q$  and can be characterized by two processes: a slow motion (of the whole cation), which is diffusive in nature and faster localized dynamics, associated with chain and ring librations.

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