# Effect of carbon porous texture on the phase transitions of nanoconfined ionic liquids

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## Abstract

Lowering the melting point of ionic liquids (ILs) owing to the confinement effect in carbon nanopores is reported. Three aprotic ILs consisting of the same imidazolium-based cation (EMIm) and FSI, TFSI, $BF_4$ anions were selected for this study. The effect of confinement in porous carbons – microporous carbon (Maxsorb, Kensai), home-made templated mesoporous carbon (MP98B) and also mesoporous carbon black (SC2A, Cabot), on the phase transitions of neat ILs has been studied by differential scanning calorimetry. The ILs have been adsorbed in preliminary degassed carbons, while varying the ratio ($V_C/V_{IL}$) of accessible pore volume of carbon ($V_C$) and volume of IL ($V_{IL}$) from 0.25 to 2.00. Investigation of the effect of pore fullness showed that a gradual increase in $V_C/V_{IL}$ leads to decrease bulk enthalpy of fusion ($\Delta H_f$) of the adsorbed ILs. Present study suggests that the porous texture of carbon materials plays a crucial role determining the features of phase behavior of nanoconfined ILs. For instance, as compared to the neat IL, the melting temperature of EMImFSI confined in SC2A (for $V_C/V_{IL} \geq 1$) is downshifted by ca. 30 ºC. Presented experimental results may be of great practical interest from the point of view of the possibility of improving the low-temperature performance of electrochemical capacitors (ECs) operating due to the application of new physical principle.