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**Design, Synthesis and Properties of Acidic Deep Eutectic Solvents  
Based on Choline Chloride**

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**Abstract**

Four deep eutectic solvents (DESs) based on different acids as hydrogen bond donors (HBDs), namely *p*-toluenesulfonic acid (PTSA), trichloroacetic acid (TCA), monochloroacetic acid (MCA), and propionic acid (PA) with hydrogen bond acceptor (HBA) choline chloride (ChCl) are synthesized with a mole ratios of HBD to HBA is 2:1. The density, electrical conductivity, dynamic viscosity and refractive index of the four DESs were determined at atmospheric pressure and temperatures from (288.15 to 338.15) K at an interval of 5 K. The results show that the temperature has great influences on the physical properties of DESs. The thermal expansion coefficient, molecular volume, standard molar entropy, and lattice energy were calculated by empirical equation. The molar conductivity was determined from the data of density

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