

Title (7)	:	Potential Green Liquid from Ternary Deep Eutectic Solvent Composed of Gallic Acid, Urea and Zinc Chloride: Characterization of their Physicochemical and Thermal Properties [Potensi Cecair Hijau daripada Pelarut Eutektik Terdalam Ternari daripada Asid Galik, Urea, dan Zink Klorida: Pencirian Sifat Fisikokimia dan Termannya]
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Abstract	:	Deep eutectic solvents (DESs) have attracted wide attention due to their cheaper cost, ease of manufacture, lower toxicity, and biological compatibility. In this study, we offer a more affordable and adaptable path to similar systems using gallic acid (GA), urea (U), and zinc chloride (ZnCl ₂). The mixture produced, called GA-based DES, was prepared at varying molar ratios of 1:5:1, 1:6:1, 1:7:1, and 1:8:1 (GA:U:ZnCl ₂). The eutectic liquid form of the GA-based DES mixture was obtained when heated at an operating temperature of 120 °C, below the melting temperature of each individual chemical. The structural and physicochemical properties of the DESs were studied via Fourier transform infrared spectroscopy, thermogravimetric analysis, and viscosity test. Different molar ratios of the DES mixture affected the hydrogen bond interaction formed between GA and U as the hydrogen bond donors and ZnCl ₂ as the hydrogen bond acceptor in the DES mixture with the presence of O–H stretching and N–H stretching vibration bands as an association effect of GA, U, and ZnCl ₂ . An increase in the U ratio weakened the hydrogen bond and reduced the viscosity of the liquid in the DES mixture due to an increase in O–H stretching.