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**OPTIMIZING PHYSICOCHEMICAL PROPERTIES OF POTASSIUM CARBONATE
AND 1,2-PROPANEDIOL MIXTURE AT DIFFERENT MOLAR RATIOS AND
TEMPERATURES TO ENHANCE SOLVENT EFFICIENCY**

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**OPTIMIZING PHYSICOCHEMICAL PROPERTIES OF
POTASSIUM CARBONATE AND 1,2-PROPANEDIOL
MIXTURE AT DIFFERENT MOLAR RATIOS AND
TEMPERATURES TO ENHANCE SOLVENT
EFFICIENCY**

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ABSTRACT

OPTIMIZING PHYSICOCHEMICAL PROPERTIES OF POTASSIUM CARBONATE AND 1,2-PROPANEDIOL MIXTURE AT DIFFERENT MOLAR RATIOS AND TEMPERATURES TO ENHANCE SOLVENT EFFICIENCY

Conventional organic solvents are widely used in chemical processes, but they suffer from critical drawbacks such as toxicity, flammability, and volatility, posing risks to human health and the environment. As the demand for safer, greener alternatives grows, deep eutectic solvents (DESs) have emerged as promising eco-friendly options due to their tunable physicochemical properties. This research focused on the potassium carbonate (PC) and 1,2-propanediol (PG) deep eutectic solvents (DESs) physicochemical properties at two different molar ratios, 1:12 and 1:16. The purpose of the study was to measure the solubility, pH, and intermolecular hydrogen bonding of PC-PG in 1:12 and 1:16 ratios, as well as to analyse the impact of these ratios and temperatures on density, viscosity, and ionic conductivity of the prepared DES. Both DESs were fully characterized comprising solubility tests, pH measurement, FTIR spectroscopy, and evaluation of density, viscosity, and ionic conductivity in the range of 30 °C to 70 °C. 1:12 and 1:16 DESs resulted in stable homogeneous liquids. The 1:12 DES showed higher pH and viscosity but lower density and ionic conductivity compared to 1:16 DES. FTIR analysis confirmed the formation of DESs through the presence of broad O–H and C–O stretching bands, with the 1:16 DES showing stronger hydrogen bonding and more significant spectral shifts. Changes in molecular structure influenced transport properties of the DES systems. The 1:16 DES showed better performance in terms of conductivity and flow behaviour, making it more suitable for applications that require enhanced ion mobility and reduced resistance. This study provides fundamental insight into the relationship between DES composition and temperature on hydrogen bonding, and physical properties, contributing to the design of greener and more tunable solvent systems.

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