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THE UPHILL DIFFUSION OF GLYCEROL IN THE SINGLE COMPONENT SYSTEM

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Abstract. In the uphill diffusion, diffusion flux goes up to a higher concentration area. Uphill diffusion often occurs in multicomponent systems and the cause of uphill diffusion is the coupled diffusion effect. However, uphill diffusion can occur in single-component systems (single uphill diffusion). In this paper, authors recent studied results about single uphill diffusion of glycerol in water. Theory, simulation, and experiment have shown that: i) single uphill diffusion can occur for glycerol solution; ii) dynamics of single uphill diffusion of glycerol is the thermal velocity in the low concentration is greater than that in high concentration area; ii) an experimental result agrees with theory and simulation.

Keywords: *Uphill diffusion, single-component system.*

I. INTRODUCTION

Uphill diffusion often observes in multicomponent systems [1-20]. The cause of uphill diffusion is the coupled diffusion effect (this is the diffusion flux of any component depends on the concentration gradient of the partner component) [12]. However, the uphill diffusion can occur in single-component system and the cause of single uphill diffusion is the difference between thermal velocity in high concentration and low concentration regions [21-23]. Studied results of single uphill diffusion for glycerol presented and discussed as follows.

II. UPHILL DIFFUSION AND SINGLE UPHILL DIFFUSION

General diffusion process can classify in for types (Fig.1a) [12]:

i) The diffusion flux goes down to a lower concentration area, that is the downhill diffusion;

ii) The diffusion flux goes up to a higher concentration area, that is the uphill diffusion;

iii) Although the concentration gradient equals to zero, the diffusion flux does not vanish, that is the osmotic diffusion;

iv) The concentration gradient does not equal to zero, the diffusion flux vanishes, and that is the diffusion barrier.

Most of the uphill diffusion occurs in multicomponent systems and dynamics of the uphill diffusion is coupled diffusion effect [6, 11, 12].