

LEY DE FICK DE LA DIFUSIÓN

PARA DIFUSIÓN DE A EN B

$$\mathbf{j}_A = -\mathcal{D}_{AB} \nabla C_A$$

Coordenadas Rectangulares

$j_{A,x} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial x}$	$j_{A,y} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial y}$	$j_{A,z} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial z}$
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Coordenadas Cilíndricas

$j_{A,r} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial r}$	$j_{A,\theta} = -\frac{\mathcal{D}_{AB}}{r} \frac{\partial C_A}{\partial \theta}$	$j_{A,z} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial z}$
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Coordenadas Esféricas

$j_{A,r} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial r}$	$j_{A,\theta} = -\frac{\mathcal{D}_{AB}}{r} \frac{\partial C_A}{\partial \theta}$	$j_{A,\phi} = -\frac{\mathcal{D}_{AB}}{r \sin \theta} \frac{\partial C_A}{\partial \phi}$
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NOTACIÓN:

C_A = concentración molar de A (kmol/m³)

∇C_A = gradiente de concentración de A (kmol/m⁴)

\mathcal{D}_{AB} = difusividad de A en B (m²/s)

\mathbf{j}_A = densidad de flujo molar por difusión de A (kmol/m²·s)

ECUACIÓN GENERAL DE FLUJO

$$\mathbf{n}_A = -\mathcal{D}_{AB} \nabla C_A + \frac{C_A}{C} \sum \mathbf{n}_i$$

Coordenadas Rectangulares

$n_{A,x} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial x} + \frac{C_A}{C} \sum n_{i,x}$	$n_{A,y} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial y} + \frac{C_A}{C} \sum n_{i,y}$	$n_{A,z} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial z} + \frac{C_A}{C} \sum n_{i,z}$
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Coordenadas Cilíndricas

$n_{A,r} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial r} + \frac{C_A}{C} \sum n_{i,r}$	$n_{A,\theta} = \frac{-\mathcal{D}_{AB}}{r} \frac{\partial C_A}{\partial \theta} + \frac{C_A}{C} \sum n_{i,\theta}$	$n_{A,z} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial z} + \frac{C_A}{C} \sum n_{i,z}$
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Coordenadas Esféricas

$n_{A,r} = -\mathcal{D}_{AB} \frac{\partial C_A}{\partial r} + \frac{C_A}{C} \sum n_{i,r}$	$n_{A,\theta} = \frac{-\mathcal{D}_{AB}}{r} \frac{\partial C_A}{\partial \theta} + \frac{C_A}{C} \sum n_{i,\theta}$	$n_{A,\phi} = \frac{-\mathcal{D}_{AB}}{r \text{ sen } \theta} \frac{\partial C_A}{\partial \phi} + \frac{C_A}{C} \sum n_{i,\phi}$
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NOTACIÓN:

C_A = concentración molar de A (kmol/m³)

∇C_A = gradiente de concentración de A (kmol/m⁴)

\mathcal{D}_{AB} = difusividad de A en B (m²/s)

\mathbf{n}_A = densidad de flujo molar total de A (kmols/m²·s)

$\sum \mathbf{n}_i$ = suma de las densidades de flujo molar total de todos los componentes (kmol/m²·s)

(para sistema binario, $\sum \mathbf{n}_i = \mathbf{n}_A + \mathbf{n}_B$)