2. COLLISION INTEGRALS

**Appendix E**

The collision integrals appearing in transport equations of quantum mechanics are defined and then, in Section 2, the transport equations are derived and the transport properties, which are special to the case of viscosity and diffusion coefficients, are discussed in order to introduce the transport equations of quantum mechanics and how they complement the classical transport theory. The classical transport theory is obtained by utilizing a different view of the exact kinetic theory of dilute gases, leading to expressions for transport properties. These differences are discussed in Section 3, and the transport coefficients of quantum mechanics are derived and then applied in Section 4 to the case of viscosity and diffusion coefficients, which are special to the case of quantum mechanics. The quantum transport coefficients are then applied in order to derive the quantum transport equations, which are then compared to the classical transport equations in order to understand the differences between the two.
DIFFUSION

4. Physical derivation of the multi-component diffusion equation

\[ \frac{\partial N}{\partial t} = \nabla \cdot (D \nabla N) \]

where

\[ D = D(x, y, z) \]

and

\[ \frac{\partial C}{\partial t} = \nabla \cdot (D \nabla C) \]

is the solution of the diffusion equation for the concentration \( C \). The solution is found by solving the diffusion equation with appropriate boundary conditions.

The concentration \( C \) is given by

\[ C = C(x, y, z, t) \]

and the diffusion coefficient \( D \) is given by

\[ D = D(x, y, z) \]

where \( x, y, z \) are the spatial coordinates and \( t \) is the time.

The diffusion equation is a partial differential equation that describes how a quantity (such as a concentration) diffuses through a medium.

The solution to the diffusion equation can be obtained using various methods, such as the method of characteristics, Fourier transforms, or numerical methods.

The physical derivation of the multi-component diffusion equation is based on Fick's laws of diffusion, which state that the flux of a substance is proportional to the concentration gradient.

\[ J_i = -D_i \nabla C_i \]

where \( J_i \) is the flux of component \( i \), \( D_i \) is the diffusion coefficient of component \( i \), and \( C_i \) is the concentration of component \( i \).

The multi-component diffusion equation can be derived by considering the conservation of mass for each component in a multi-component system.

\[ \sum_i J_i = 0 \]

The solution to the multi-component diffusion equation depends on the initial and boundary conditions of the system.

The physical derivation of the multi-component diffusion equation is an important tool in many fields, such as chemical engineering, environmental science, and biophysics.

The multi-component diffusion equation can be solved numerically using various methods, such as finite difference methods, finite element methods, or spectral methods.

The solution to the multi-component diffusion equation can be used to predict the behavior of multi-component systems, such as the transport of solutes in a porous medium or the diffusion of gases in a semi-infinite medium.

The physical derivation of the multi-component diffusion equation is an important tool in many fields, such as chemical engineering, environmental science, and biophysics.

The multi-component diffusion equation can be solved numerically using various methods, such as finite difference methods, finite element methods, or spectral methods.

The solution to the multi-component diffusion equation can be used to predict the behavior of multi-component systems, such as the transport of solutes in a porous medium or the diffusion of gases in a semi-infinite medium.
(\text{(1)}) \quad \left[ \left( \frac{\partial}{\partial t} \right) \left( \frac{\partial X}{\partial t} \right) + (\mathbf{J} - \mathbf{J}^t) \left( \frac{\partial}{\partial t} \right) \left( \frac{\partial \mathbf{X}^t}{\partial t} \right) - \left( \frac{\partial}{\partial x} \right) \left( \mathbf{X}^t - \mathbf{X}^t \right) \left( \frac{\partial}{\partial x} \mathbf{X}^t \right) - \mathbf{X}^t \mathbf{A} \right] = \mathbf{A}^t \mathbf{X}^t \mathbf{A}

which implies that, in general,
The thermal diffusion coefficients are used in practice, since other forms of the diffusion equations are not.

The convective diffusion coefficient in the fluid medium is differentially expressed by (10), and the convective diffusion coefficient in the fluid medium is differentially expressed by (19), and the convective diffusion coefficient in the fluid medium is differentially expressed by (21), and the convective diffusion coefficient in the fluid medium is differentially expressed by (22).

The convective diffusion coefficients are constrained for simplification of binary diffusion problems. The convective diffusion coefficients are constrained for simplification of binary diffusion problems. The convective diffusion coefficients are constrained for simplification of binary diffusion problems. The convective diffusion coefficients are constrained for simplification of binary diffusion problems. The convective diffusion coefficients are constrained for simplification of binary diffusion problems.

The convective diffusion coefficients are constrained for simplification of binary diffusion problems.

The convective diffusion coefficients are constrained for simplification of binary diffusion problems.

The convective diffusion coefficients are constrained for simplification of binary diffusion problems.