Annexure A

In order to distinguish expiratory droplets from background aerosols in the numerical model, background aerosols and expiratory aerosol droplets are termed as component Type A and component Type B, respectively. The hetero-coagulation of background (Type A) aerosols and the expiratory particles (Type B) leads to the following aerosol types:

$$A + A \ = A \qquad (A1)$$

$$B + B \ = B \qquad (A2)$$

$$A + B \ = AB \qquad (A3)$$

The dynamics of these multi-component aerosol population is governed by the following general dynamic equation (GDE) with chemical composition as the independent variables(Kim and Seinfeld, 1992)

$$\frac{dn(\vec{m},t)}{dt} = \frac{1}{2}\int_0^{m_1} \dots \int_0^{m_s} K(U, M-U) n(\vec{u},t) n(\vec{m}-\vec{u},t) d\vec{u}$$
$$-n(\vec{m},t)\int_0^{\infty} \dots \int_0^{\infty} K(U,M) n(\vec{u},t)\, d\vec{u} \qquad (A4)$$

where, m_i is the mass of the i^{th} component in a particle, and $\vec{m}$ is a vector of compositions (m_1,… m_s), where, s is the total number of components (2, in the present study). $n(\vec{m},t)\ d\vec{m}$ is the number of particles having a mass of component i in the range $(m_i,\ m_i + dm_i)$ at time t. $K(U,M) = K(M,U)$ is the Brownian coagulation coefficient, represented by the Fuchs coagulation kernel(McDonald, 1964), where U, M are particle sizes given by, $M = \sum_{j=1}^{s} m_j$.For the present study, Eq. (A4) is discretized in the particle size to handle the two components, Type A & B, and solved using sectional multi-component aerosol coagulation model(Jacobson et al., 1994).