
On the constitutive assumptions for the recombination term for the R-D-D equations for scintillators

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Abstract

The evolution equations for inorganic scintillators (which converts ionizing radiations into visible light) were obtained in previous papers: they are Reaction-Diffusion-Drift equations, coupled with the Poisson equation of electrostatics and Neumann boundary conditions, in terms of the m -dimensional charge carriers vector. These equations were obtained by the means of a microstructured continuum model where the rate-of-change of the director is identified with the scintillation potential. Here we shall deal with various constitutive assumptions for the recombination term and show how, when we choose the Gibbs-Boltzmann entropy, we can recover the cubic polynomial expression used in one of the few previous existing phenomenological models. Further we shall show how a polynomial representation can be obtained as a limit of a Markov process and also explore the instance in which the entropic term is represented instead by the Fermi-Dirac potentials.

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