

2.3: Absorption, Scattering and Attenuation Coefficients

The decrease in radiance $-dL$ as a beam of radiance L passes through a medium of thickness ds as a result of absorption is

$$-dL = \alpha L ds \quad (2.3.1)$$

where α is the **linear absorption coefficient**. With similar equations we can define the *linear scattering coefficient* σ and the *linear attenuation (extinction) coefficient* ε . The SI units of α , σ and ε are m^{-1} and $\varepsilon = \sigma + \alpha$.

The *mass absorption coefficient*, *mass scattering coefficient* and *mass extinction coefficient* each with units $\text{m}^2 \text{kg}^{-1}$ are defined respectively as α/ρ , σ/ρ and ε/ρ , where ρ is the density (kg m^{-3}) of the medium. Chandrasekhar uses κ for the mass extinction coefficient, which, in the theory of stellar atmospheres, is also known as the **opacity**.

The *atomic (or molecular) absorption, scattering and extinction coefficients* are respectively α/N , σ/N and ε/N , where N is the number density (atoms or molecules per unit volume), with units of m^2/atom (or molecule). Because of these units the coefficients are often referred to as **cross-sections**.

This page titled [2.3: Absorption, Scattering and Attenuation Coefficients](#) is shared under a [CC BY-NC 4.0](#) license and was authored, remixed, and/or curated by [Max Fairbairn & Jeremy Tatum](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.