

ABSTRACT

Black carbon is an anthropogenic pollutant ubiquitously spread in the environment and adversely affects the human health, atmosphere and ecosystems. However, the behaviour of the black carbon nanoparticles (BC NPs) varies in the atmosphere and the hydrosphere. The present study investigated the aggregation kinetics of the colloidal BC NPs in an aquatic environment with varying solution chemistry as an effect of ionic strength and ionic valence in absence and presence of humic acid (HA). The BC NPs showed very poor aggregation in presence of monovalent Na^+ and was almost insensitive to the ionic strength, whereas the divalent Ca^{+2} cations showed highest effect on the aggregation of the BC NPs, followed by trivalent Fe^{+3} cations, and the aggregation effect enhanced with the increasing ionic strength. In presence of HA, the hydrodynamic diameter of the BC NPs significantly dropped than that of in absence of HA, irrespective of the ionic strength of the electrolytes. The stabilising capacity of the HA was stronger even at lower concentrations (1 mg/L) and keep increasing with increasing concentrations of HA. Overall, the study indicated the high potential of HA as a stabilising agent towards restricting the aggregation of the BC NPs in the aquatic environment.