Hydrodynamics with heat transfer in an air-kerosene bubble column at high pressure using CFD

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A gas-liquid Eulerian computational fluid dynamics (CFD) coupled with the population balance equation (PBE) was employed in an air-kerosene bubble column at 3.5 MPa. Two parameters in the CFD-PBE model including the drag and breakage correction factors (DBCFs) accounted for the effect of pressure on drag force and bubble breakup. The gas holdup and bubble size determine the interfacial area, which is an important parameter for the mass transfer between two phases. The temperature influences the gas and liquid physical properties. High temperature decreases the liquid viscosity and surface tension, which reduces the bubble size and increase the gas holdup. High temperature also enhances the bubble dilation leading the increase in bubble size. The CFD results with and without heat transfer model were compared with each other. The CFD-PBE model with DBCF has a potential to predict hydrodynamics of a gas-organic liquid bubble column.