Abstract

The aim of this thesis was to identify the morphological features of sea spray aerosol particles and solid particles originating from ship engine combustion, and to highlight their differences depending on the mechanism of formation and the type of emitted particle. The theoretical part provides an overview of the sources of aerosol and particulate matter (PM) emissions from maritime transport, including the processes of their generation, chemical composition, particle size, and characteristic properties. It also includes a review of marine fuels currently in use and a comparison between diesel and alternative fuels, with a focus on their emission profiles. In the context of the harmful effects of maritime emissions, the thesis addresses their impact on human health, local air quality in port areas, and the potential measures for regulating emission levels.

The practical part of the thesis involved comparing available image data from the literature with real particles collected using scanning electron microscopy (SEM). The particles' shape and size were subsequently classified based on established morphological criteria. The results show that particles generated by incomplete combustion in ship diesel engines exhibit a greater diversity in structure, often displaying spherical or fragmented shapes, with sizes ranging from nanometers to micrometers. A key finding was the interaction between microdroplets and combustion particles. The expected mechanism of nanoparticle capture by microdroplets was confirmed through SEM imaging. Interestingly, supermicron particles – identified through morphological shape analysis as cenospheres, which are also combustion products of ship diesel engines, were observed attached to the microdroplets.

Key words: atmospheric aerosol, ships, diesel, microdroplets