

Spectrometer to profile the smallest atmospheric particles and ions

Neutral Cluster and Air Ion Spectrometer (NAIS) for research and education

1. Background

Atmospheric aerosol particles affect climate and air quality. Primary particles are road dust, sea salt and pollen. On the other hand, secondary particles form from gas molecules in the air. In our laboratory, we investigate the chemistry and physics of secondary particle formation. This process affects air quality as well as clouds and climate.

2. What can this instrument measure?

The donation from COWIfonden will allow us to purchase a Neutral Cluster and Air Ion Spectrometer (NAIS, Airel OÜ, Estonia). NAIS can measure particles of the smallest sizes, 2-40 nanometers in diameter, just above the size of the molecules themselves. In addition, NAIS can measure the concentration of air ions down to 0.8 nanometers in diameter. With the help of this data, we will be able to determine how much of small particles is formed in our lab experiments and outdoors.

This instrument will be used in several projects. It will be deployed in the laboratory to quantify particles made in the flow reactor and smog chamber systems. NAIS will complement the existing instruments, including the Scanning Mobility Particle Sizer, which measures larger particles. In addition, NAIS will be an essential tool for field measurements that are planned in urban and remote environments. Several research groups will benefit from having this instrument available.

3. Exciting tool for education projects

NAIS will also be used extensively in education. One planned BSc thesis project will be the characterization of nucleation mode particles (2-20 nm) at an urban background station in Copenhagen. A study of ion-induced particle formation based on similar measurements is planned as an MSc thesis project. Moreover, NAIS will be used in most laboratory and field measurements by PhD students in the group.

4. Long-term perspective

The NAIS spectrometer will allow us to study particle formation and growth in the atmosphere as well as educate students on topics of climate and air pollution. The availability of this state-of-the-art tool will allow our research group to develop collaborations with other groups in Denmark and abroad.