A purpose-built cylindrical resuspension chamber (V=0.437 m^3, S=0.35 m^2, S/V=8.38) was used for the dispersion of samples of soil and various kinds of dust. The samples were studied from the point of view of the number and mass distribution of aerosol particles which could affect the concentration of atmospheric aerosol. The samples were taken from lignite, power plant flue ash and from overburden soil in the North Bohemian surface mine Nastup. The individual samples were pneumatically dispersed inside the chamber under defined temperature-humidity conditions (20°C and relative humidity (RH) 50 %). An APS (Aerodynamic Particle Sizer) processing provided us with average size distributions of particle mass and number. Lignite and flue ash probably have the greatest potential impact on the concentration of atmospheric aerosol in the studied locality. The amount of the resuspended mass of the samples varied between 0.001 % (overburden soil) and 0.32 % (mine road). The lignite and flue ash samples were then analyzed by gravimetric methods using the HI (Harvard Impactor) and the SCI (Sioutas Cascade Impactor). The flue ash contained higher amounts of fine particles than the lignite. Subsequent chemical analysis by electron microscope of the filters with deposits of power plant flue ash showed that the $PM_{2.5}$ fraction had the highest content of sulphur, and PM_{10} was dominated by Si. From the mineralogical point of view, the PM_{10} fraction was closest to mullite, the $PM_{2.5}$ fraction contained sulphides, pyrites, pyrrhotites and polytypes of sulphide. The PM_1 fraction was dominated by Quartz glass. The 2.5-1 μm and 0.5-0.25 μm fractions were dominated by Si and S respectively.