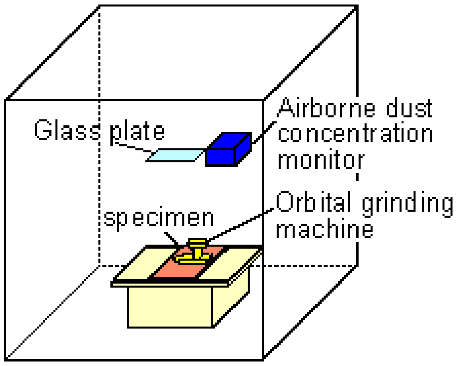
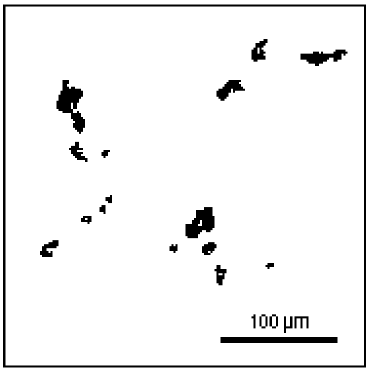
1994

Simulation of Density Distribution of Fine Dust in Woodworking Chamber

The time changes of the dust concentrations as well as of the distribution of the particle sizes were predicted by computer simulations, when the drag force, due to the friction between the particles and air, is generated on the particles in free falling. It revealed the influence of shapes of the fine particles on the falling speed, which ware preserved in an image analysis and of the irregular shapes, should be taken into consideration for more correct simulations.

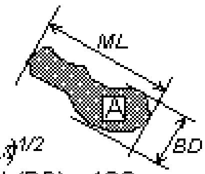
Experimental setup for measuring airborne dust concentration. The wood working chamber is of 2.5m by 2.5m square and of 3m height.

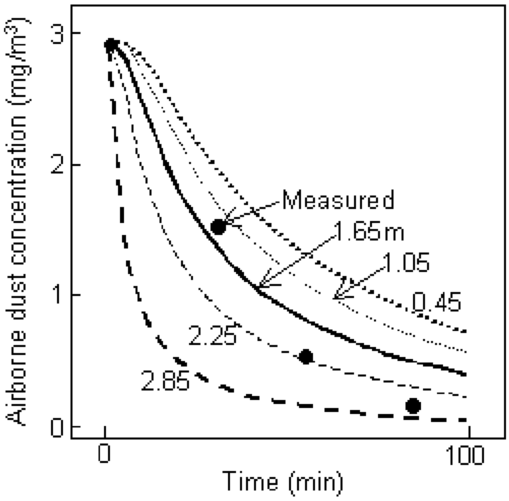




The observed image of particles fallen on a glass plate

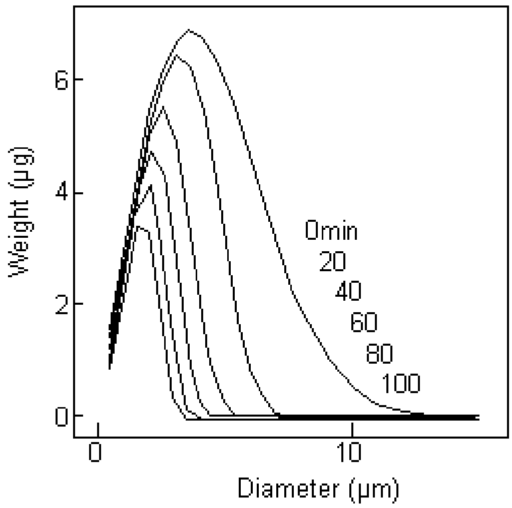
Maximum length *ML*
Maximum breadth *BD*
Area *A*
Perimeter *PM*
Heywood diameter $HW = 2(A/\pi)^{1/2}$
Slenderness ratio $ML/BD = (ML/BD) \times 100$
Shape function $ML2/A = (((ML/2)^2 \times \pi/A) \times 100$
Shape function $PM2/A = (((PM/2)^2/\pi A) \times 100$





Simulated time changes of airborne dust concentration in comparison with measured values.

* initial concentration of 2.96 mg/m³ was used to all the element cubic spaces in the height direction.



Simulated time changes of distribution of Heywood diameters.