

# Investigation of solid morphology based on image analysis and fractal dimensions

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Kazuo Nishimoto

Investigation of solids mixing as well as morphologies of powder surface and degraded rubber surface was done using image analysis combined with fractal analysis.

First, it was shown by the analysis of crazing patterns of the degraded rubber surface that the specific crazing area and the fractal dimension can be used as quantitative criteria for assessing the degree of rubber degradation.

Second, the mixing characteristics of rubber in an internal mixer was investigated by spectral analysis of electric power consumption. The relationship between the power spectral density and frequency yielded a fractal dimension, which was shown to be good indicative of the degree of mixing. Physical significance of the frequencies, where major peaks appear in the power spectral density, was explained also.

Third, experiments on size enlargement of fine powders by means of pressure swing were done. The relation between the fractal dimension of enlarged granular surface and experimental conditions were discussed.

Finally, it was shown, experimentally and numerically using molecular dynamics simulations, that the convective motion and mixing of particles within vibrated beds were amenable to characterization by a fractal property. The local variations of the rate of mixing within the bed were discussed also.