THE ACOUSTIC EMISSION OF SILICA GEL

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1. INTRODUCTION

Our research group has recently determined by infrared spectroscopy that the surface of booming sand particles is coated with an amorphous silica layer (1) and that by changing this layer the musicality of the sand is affected (2). It has also be reported that pure silica gel particles have acoustic emission (3). While it had previously been reported that the acoustic emission of booming sand was affected by the size of the particles and the number of particles (4) the following investigation looks at the effect of these factors on the acoustic emissions of silica gel.

2. RESULTS

By fractionating the silica gel particles and studying the acoustic emissions of varying numbers for each particle size, a relationship between the carrier period and the size and number of particles was determined. Figure 1 shows that, for silica gel particles in the size range of 150 - 300 microns varying from 1.5 to 10 million particles, the carrier period increased as both the size and number increased. The carrier period ranges from 1.4 ms to 2.6 ms corresponding to a carrier frequency ranging from 714 Hz to 385 Hz. Figure 2 shows an increasing beat period as the size and number of silica gel particles increased. The beat period ranges from 6.8 ms to 18.0 ms corresponding to a beat frequency from 147 Hz to 56 Hz.

The composition of silica gel particles was also investigated. The hypothesis that there is a layer of amorphous silica gel on booming sand which is necessary for its musicality leads to the idea that there may also be a layer on the silica gel particles. By using a scanning electron microscope it was possible to detect, on various silica gel particles, a layer around the silica gel core. This layer was found to be composed of the same material as the core but possessing a different density - presumably the presence of water.

3. CONCLUSIONS

The hypothesis that particle size and sample size affect the acoustic emissions of silica gel, as reported for booming sand, was verified for pure silica gel in the range of 150 to 300 microns. The layer of amorphous silica as seen on the silica gel particles using the scanning electron microscope, may lead to further investigation of the surface layer on musical sand particles and its effect on the acoustic emissions.

REFERENCES

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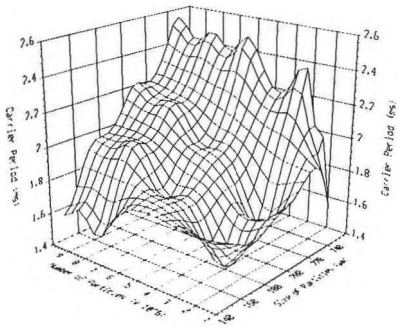

Figure 1. Carrier Period of Silica Gel as a Function of Particle Size and Number.

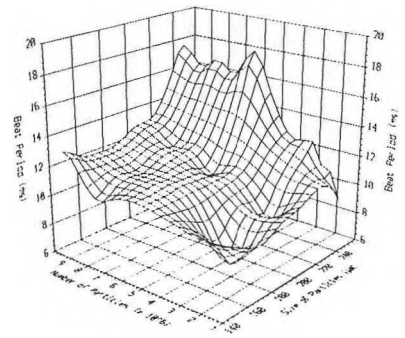

Figure 2. Beat Period of Silica Gel as a Function of Particle Size and Number.