Table 1

Target dry density (g/cm^3)	**0.8**	**0.7**	**0.6**	**0.5**
Stucco	1	1	1	1
Water (weight ratio to stucco)	0.77	0.75	0.72	0.69
Foam (weight ratio to stucco)	0.03	0.05	0.08	0.11

Results: Quantitative analysis of foam morphology and microstructure of gypsum specimens

The morphology of the foam and the core structure of gypsum specimens were analysed in using optical microscopy equipment and ImageJ® software.

Curves 1 and 2 on Figure 4(a) show the cumulative volume distributions of the foam bubbles generated in Comparative Example 1 and Example 1 respectively. Curves 1' and 2' show the respective first derivatives of the cumulative volume distributions. The volume average bubble size ($\ddot{X}_w$) for Comparative Example 1 and Example 1 is defined by the position of the peak of Curve 1' and Curve 2' respectively.

Similarly, Curves 3 and 4 on Figure 4(b) show the cumulative number distributions of the foam bubbles generated in Comparative Example 1 and Example 1 respectively. Curves 3' and 4' show the respective first derivatives of the cumulative number distributions. The number average bubble size ($\ddot{X}_n$) for Comparative Example 1 and Example 1 is defined by the position of the peaks of Curve 3' and Curve 4' respectively.

The bubble size dispersity $Đ_{X(foam)}$ is calculated as the ratio of volume average bubble size to the number average bubble size.

Curves 5 and 6 on Figure 5(a) show the cumulative volume distributions of the pores present in the cores of the gypsum specimens prepared in Comparative Example 1 and Example 1 respectively. Curves 5' and 6' show the respective first derivatives of the cumulative volume distributions. The volume average pore size ($\ddot{X}_w$) for the gypsum specimens of Comparative Example 1 and Example 1 is defined by the position of the peak of Curve 5' and Curve 6' respectively.

Similarly, Curves 7 and 8 on Figure 5(b) show the cumulative number distributions of the pores present in the cores of the gypsum specimens prepared in Comparative Example 1 and Example 1 respectively. Curves 7' and 8' show the respective first derivatives of the cumulative number distributions. The number average pore size ($\ddot{X}_n$) for the gypsum specimens of Comparative Example 1 and Example 1 is defined by the position of the peaks of Curve 7' and Curve 8' respectively.

The pore size dispersity ($Đ_{X(core)}$) is calculated as the ratio of volume average pore size to the number average pore size.

CLAIMS

1. Apparatus for preparing foam for incorporation into cementitious slurry, comprising a conduit having an inlet for receiving a gas feed and a surfactant feed, and an outlet for allowing the exit of foam, the conduit housing a porous plug that provides a partial barrier to fluid flow along the conduit, the plug comprising a plurality of particles that are packed in a regular array, the particles defining a three-dimensional network of pores extending therebetween, in which the apparatus comprises a resilient component located between the plug and the conduit.

2. Apparatus according to Claim 1, in which the resilient component comprises a sleeve disposed on a radially inward side of the conduit.

3. Apparatus according to Claim 2, further comprising means for applying pressure to the sleeve in a radially inward direction of the sleeve, to urge the sleeve against the plug of particles.

4. Apparatus according to Claim 1, 2 or 3 in which the outlet comprises a sieve, the sieve comprising an array of projections that are directed towards the downstream end of the plug, the projections being arranged to provide a corresponding array of apertures therebetween, so as to allow foam to exit the plug.

5. Apparatus according to Claim 4, in which the projections are hemispherical.

6. Apparatus according to Claim 5, in which the diameter of the projections is between one and four times the diameter of the spherical particles.

7. Apparatus according to any preceding claim, in which the outlet tapers in a downstream direction of the conduit, and/or the inlet flares outwardly in a downstream direction of the conduit.

8. A method of preparing foam for incorporation into gypsum slurry, comprising the steps of: providing an apparatus according to any one of the preceding claims; supplying a first feed and a second feed to the conduit via the conduit inlet, the first feed comprising a gas and the second feed comprising a surfactant; and driving the first and second feed through the plurality of particles to form a foam.

9. A method according to Claim 8, further comprising the step of applying pressure to the sleeve in a radially inward direction of the sleeve, to urge the sleeve against the plug of beads.

10. A method according to Claim 9, in which the pressure is in the range 3-9 bar.

11. A method according to Claim 8, 9 or 10, in which the gas pressure at the outlet of the conduit lies in the range 1-3 bar.

12. A method according to any of Claims 8 to 11, further comprising the step of adding a stabilising additive to the foam.

13. A method according any of Claims 8 to 12, comprising the further step of incorporating the foam into a hydraulic binder slurry, such as a gypsum slurry.

14. A method of preparing a gypsum product, comprising the steps of providing a gypsum stucco slurry, and incorporating a foam produced using a method according to any of Claims 8 to 13 into the slurry, in which the bubble size dispersity index of the foam is below 1.4, and the mean bubble size of the foam is at least 100μm.

15. A cementitious product produced using a method according to Claim 13, in which the dispersity of the pores is below 1.4, and the mean pore size is at least 300μm.