Buoyant bubble rise through concentrated particulate suspensions with potential application to crystallizing magmas

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Buoyant rise of bubbles through magmas containing a large fraction of crystals, of similar or smaller size than the bubbles themselves, are of importance in some magmatic processes· One example is bubbles rising through a crystallizing mafic magma, intruded beneath a silicic magma body, and potentially of importance for the rejuvination of the silicic host· The presence of crystals will significantly increase magma viscosity and reduce bubble rise speed· In addition, nonNewtonian rheological effects ⟨e·g·, strain rate dependence, strain dependence, yield stress⟩ may also affect how the ascending bubbles interact with one another· For example, the presence of crystals has the potential to affect bubble coalescence, thereby modulating the overall behavior of the system, because it may affect the density distribution, as well as the rheology of the three−phase suspension· Here we report preliminary results on the relationship between crystal size and content, bubble size and content, as well as rheology on the bubble rise speed and dynamics, using analog laboratory experiments·