

On the Characterization of Foam Decay with Diagram Lattices and Majorization

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We present possibilities of comparing and characterizing bubble size distributions during foam decay. We know that the temporal development of bubble size distributions does not follow an ordinary diffusion process. Instead of an equal distribution, we obtain a multi-modal distribution at the end of the rearrangement phase. It turns out that bubble size distributions are comparable to partition diagrams generating Ruch lattices which are expandable by permutations leading to partially ordered sets. If we map the partition diagrams and the bubble size distributions on the Shannon entropy, we obtain similar functions. Furthermore, the set of partition diagrams of a Ruch lattice and the set of the bubble size distributions of foam decay are both partially ordered. Via the theorems of Muirhead and of Hardy, Littlewood and Pólya (classical majorization) we construct transitions between every partition diagram of a Ruch lattice and between every bubble size distribution. These transitions can be reversible or irreversible.

Key words: Foam Decay; Bubble Size Distribution; Majorization; Diagram Lattices.