

# Physics Colloquium

Michigan Technological University

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4:00 pm

Room 139 Fisher Hall

## Elementary Kinetics of Phase Conversion in Finite Volumes



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**Abstract:** Kolmogorov-Johnson-Mehl-Avrami (KJMA) theory of phase conversion is studied in finite volumes. For the conversion time one finds the relationship  $\tau_{con}/\tau_{nu} = 1 + f_d(q)$ . Here  $d$  is the space definition,  $\tau_{nu}$  the nucleation time in the volume  $V$ , and  $f_d(q)$  a scaling function. Its dimensionless argument is  $q$  reduces the original dependence on three variables (nucleation time, expansion velocity, Volume) to just one variable;  $f_d(q)$  is calculated for  $d = 1, 2$  and  $3$ .

The often considered limits of phase conversion via either a nucleation or spinodal process are found to be volume-size dependent concepts, governed by simple power laws for  $f_d(q)$ . In the infinite volume limit the nucleation region disappears (i.e., the spinodal endpoints collapse to the critical point). Illustrations are given for Potts mode.