## Abstract Submitted for the MAR15 Meeting of The American Physical Society

Can a hard-sphere fluid feel the topology of a confining pore? GERD SCHROEDER-TURK, JOHANNES KNAUF, Friedrich-Alexander University Erlangen-Nuremberg, ROLAND ROTH, University Tuebingen, KLAUS MECKE, Friedrich-Alexander University Erlangen-Nuremberg — The confinement of simple fluids to narrow pore spaces changes the phase behaviour. A central question is the dependence of thermodynamic properties on the pore shape K. The morphometric approach for simple fluids is derived by assuming that the grand potential  $\omega(K,\mu,T)$  is an additive functional of K. Hadwiger's theorem states that  $\omega(K,\mu,T)$  only depends on K as a linear combination of the Minkowski functional,  $\Omega = -p(\mu,T)V[K] + \sigma(\mu,T)A[K] + \kappa(\mu,T)C[K] + \overline{\kappa}(\mu,T)X(K)$  where V and A are the volume and interface and C[K] the integrated mean curvature. X[K] is the Euler number that characterises the pore topology. We use density functional theory to demonstrate that this theory is consistent, for the case of triply-periodic network-like pore geometries. For these, the formula  $\langle N \rangle (K, \mu, T) = -\partial \Omega / \partial \mu$  can be inverted to give an estimate of  $X_f$  deduced from the simulated densities – the Euler number 'felt' by the fluid. We show that for the Primitive, Gyroid and Diamond minimal surfaces the obtained values are close to X. Counter-intuitively, this result suggests that hard sphere fluids can feel topological properties of a confining space, in addition to geometric ones.

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