Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Electrostatic theory of viral self-assembly: Structure and Kinetics

TAO HU, BORIS SHKLOVSKII, Department of Physics, University of Minnesota

— Viruses self-assemble from identic capsid proteins and their genome consisting, for example, of a long single stranded (ss) RNA. For a big class of T = 3 viruses capsid proteins have long positive flexible N-terminal tails. We explore the role played by the Coulomb interaction between the N-terminal tails and negative ss RNA molecule in the kinetics of virus self-assembly. Capsid proteins stick to unassembled chain of ss RNA (antenna) and slide on it towards the self-assembly site. We show that due to such one-dimensional diffusion the virus self-assembly is more than ten times faster than the case involving only three-dimensional diffusion. In the assembled virus, the ss RNA strongly interacts with the brush of tails rooted at the inner surface of the capsid. We show that viruses are most stable when the total length of ss RNA is close to the total length of the tails. For such a structure the absolute value of total (negative) charge of ss RNA is approximately twice larger than the charge of the capsid. This conclusion agrees with available structural data.

Tao Hu
Department of Physics, University of Minnesota

Date submitted: 19 Nov 2006 Electronic form version 1.4