

## Statics And Kinematics of Symmetric Swelling Viruses

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Some viruses in biology are able to expand due to the change in pH. These biological systems consist of pentagonal and hexagonal units (hexamers and pentamers) connected by protein links, and show icosahedral symmetry that is preserved also during the expansion. Swelling motion is characterised by simultaneous radial translation and rotation of polygonal units. Using symmetry-adapted first order analysis of a perfectly rigid structural model called “expandohedron”, a discussion on possible self-stresses and finite mobility is made. Finite character of swelling is proven by symmetry but other finite paths may theoretically appear. Following the fully symmetric kinematical path of expansion, some bifurcation points are found. It is shown by analytical description that translation-rotation relationship is generally not unique for pentamers even in the physically admissible domain. Data obtained from electron microscopy will be used to refine parameters of initial geometry for better approximation of virus swelling.

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