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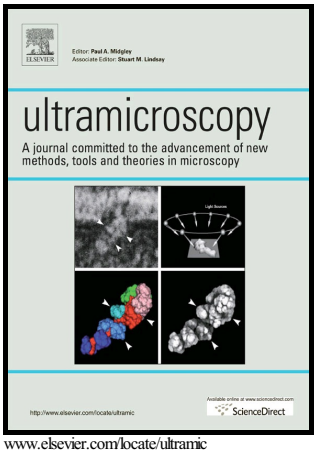

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Dependence of the volume of an antibody on the force applied in a force microscopy experiment in liquid

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Abstract

The volume of a protein can be estimated from its molecular weight. This approach has also been applied in force microscopy experiments. Two factors contribute to the determination of the volume from a force microscope image, the applied force and the tip radius. Those factors act in opposite directions. Here, we demonstrate that in the optimum conditions to image a protein, the apparent volume deduced from an AFM image overestimates the real protein volume. The lateral broadening due to the tip finite size, makes the simulated volume to exceed the real protein volume value, while the force applied by the tip tends to decrease the measured volume. The measured volume could coincide with the real volume for either a point-size tip at zero force or when the compression exerted by the tip compensates its dilation effects. The interplay between the above factors make unsuitable to apply the molecular weight method to determine the volume of a protein from AFM data.

Keywords: AFM, Volume Estimation, Convolution, Protein, IgM

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