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## Direct experimental determination of contact angles and line tensions on the nano-scale

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The wetting behaviour of liquids on solid surfaces depends on the interaction of molecules in the solid, liquid and gas phases. This interaction can be characterized by the contact angle between solid and liquid surfaces in the vicinity of the three phase contact line. For macroscopic systems a number of experimental techniques are available for measurement of contact angles. Recently intermediate micron size systems have been studied as well. However, in the nano-scale contact angles are hardly accessible. Here we report the first direct experimental determination of contact angles and contact line curvatures on a scale of 1 nm. We have considered measurements of heterogeneous nucleation of super saturated water vapour on nearly spherical and mono dispersed Ag particles with well defined seed particle radius  $r_p$  down to about 1.5 nm. From the slope of the activation curves we obtained the number  $n^*$  of molecules in the critical cluster using the nucleation theorem. On the other hand the onset saturation ratio, where 50% of the seed particles are activated, allows to determine the radius  $r^*$  of the critical cluster using the Kelvin relation. Based on  $r_p$ ,  $r^*$  and  $n^*$  the microscopic contact angle as well as radius and curvature of the contact line can be directly obtained. We find microscopic contact angles around 15 degrees compared to 90 degrees for the macroscopic equilibrium angle. This difference can be attributed to line tension as originally postulated by Gibbs. Line tension is becoming increasingly dominant with increasing curvature of the contact line.

### Biography

Paul E Wagner is currently Associate Professor at University of Vienna. Previously, he was embraced with some positions as Guest Scholar at Clarkson University, USA; Guest Scholar at Kyoto University, Japan; Visiting Professor at the University of Helsinki, Finland. He was honoured with Smoluchowski Award for Aerosol Research; Fellow of the Japan Society for the Promotion of Science; Honorary Member of the Committee on Nucleation and Atmospheric Aerosols and received Honorary Doctorate from University of Helsinki. He served as Vice President of Gesellschaft für Aerosolforschung; Chairman of Committee on Nucleation and Atmospheric Aerosols; Co-Chairman of five International Conferences. He was the author of 10 books and more than 180 refereed publications.

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