Geophysical Research Abstracts
Vol. 17, EGU2015-10340, 2015
EGU General Assembly 2015

Morphology changes in stacking-disordered ice I_{ch} as a function of time and temperature

Werner F. Kuhs (1), Andrzej Falenty (1), and Thomas C. Hansen (2)

(1) Universität Göttingen, GZG Abt.Kristallographie, Goldschmidtstr.1. 37077 Göttingen, Germany (wkuhs1@gwdg.de), (2) Institut Laue-Langevin, 71 avenue des Martyrs, 38000 Grenoble, France

Laboratory experiments have shown that ice I crystallizing from water vapour [1] or undercooled liquid water [2] under atmospheric conditions initially forms a stacking disordered arrangement of high complexity; the stacking arrangement is different depending on the starting phase[1]. Both cubic and hexagonal components are locally present and various names of this form of ice have been proposed recently: so-called ice I_c or "ice I_c"[1], ice I_{sd} [2] or ice I_{ch}[3]. It is has been shown that ice I_{ch} undergoes a progressive transformation of cubic into hexagonal stackings with time and/or increasing temperature [1]. As a mechanisms for this annealing we had proposed the cooperative action of Bjerrrum defects and moving dislocations which become active on a time-scale of minutes at temperatures close to 240K [4]. Here we show from electron-microscopic images that the presence of stacking faults is linked to numerous kinks on the prismatic faces of the trigonal ice crystals of ice I_{ch} [1]. We present details on the annealing kinetics in the temperature range between 170 and 240K and suggest that the kinks of ice I_{ch} crystals may be responsible for the roughness deduced from some air-borne light-scattering experiments, an increased reactivity in particular at temperatures below $\sim$ 200K as well as curvature-induced higher vapour pressures of ice I_{ch} as compared to normal ice I_h.

[1] W.F.Kuhs, C.Sippel, T.C.Hansen (2012) PNAS **109**:21259-21264

[2] T.Malkin, B.J.Murray, A.V.Brukhno, J.Anwar, C.G.Salzmann (2012) PNAS **109**: 1041-1045

[3] T.C.Hansen, C.Sippel, W.F.Kuhs (2014) Z.Krist. DOI 10.1515/zkri-2014-1780

[4] W.F.Kuhs, G.Genov, D.K.Staykova, T.Hansen (2004) **6**:4917-4920