

***Interactive comment on “An aerosol chamber investigation of the heterogeneous ice nucleating potential of refractory nanoparticles” by R. W. Saunders et al.***

**Anonymous Referee #1**

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This is a well written manuscript that describes the ice nucleating potential of Fe<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, and MgO. These substances are relevant both from the standpoint of ice nucleation by particles of meteoritic origin as well as terrestrial substances. Experiments were conducted over a T and RH range at the AIDA facility. Implications, e.g., contact angles based on nucleation theory, are derived and discussed in this thorough manuscript. This is a timely topic based upon the relation to aerosol/cloud interaction (climate change) and formation of both polar stratospheric and noctilucent clouds. As such I highly recommend this manuscript be published in ACP. I have only very minor comments I hope the authors will consider. 1. In the abstract contact angles are provided with a full description later in the manuscript (Data Analysis). Although

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specific contact angles are derived from the ice nucleation data via classical theory I wonder if the authors might be able to place bounds (error bars?) on these values? This might be based upon the different experimental results or the uncertainty in values that go into the derivation (or both). The reason I bring this up is that the authors note the weak dependence on T but I am not certain this is at a level greater than the uncertainty in the contact angle. 2. Ice nucleation by mixed sulfuric acid / meteoritic aerosol was observed in the UTLS region by Cziczo et al., Single Particle Measurements of the Chemical Composition of Cirrus Ice Residue During CRYSTAL-FACE, *J. Geophys. Res.*, 10.1029/2003JD004032 (2004). Although not the mesospheric location discussed in the 2nd paragraph of the introduction this may be worth referencing. 3. Given the numerous publications referenced on AIDA experiments the Experimental section could be shortened (currently ~1.5 pages of text). The text in the Results section is also somewhat redundant describing the various experiments (e.g., descriptions of time and RH at which specific fice conditions exist). This is also true of the discussions of particle composition, size, and structure. In these later two cases data of this sort might be best provided in tabular format. My concern here is that the text is rather long at ~21 pages and these sections could be shortened so that a higher focus is places on the data analysis. 4. Another reference of note is Biermann et al., The unsuitability of meteoritic and other nuclei for polar stratospheric cloud freezing, *Geophys. Res. Lett.*, 23, 1693 (1996). Understanding the aerosol source, coating, and nucleation conditions were somewhat different I wonder if the authors can compare the data?

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