Abstract: The low-temperature aerosol and cloud chamber AIDA (Aerosol Interactions and Dynamics in the Atmosphere) of Forschungszentrum Karlsruhe was used to investigate the effect of sulfuric acid coating on the ice nucleation efficiency of soot aerosol particles from a spark discharge generator. The uncoated (sulfuric acid-coated) soot aerosol showed a nearly lognormal size distribution with number concentrations of 300 -5000 cm(-3) (2500-56,000 cm-3), count median diameters of 70-140 nm (90-200 nm), and geometric standard deviation of 1.3-1.4 (1.5-1.6). The volume fraction of the sulfuric acid coating to the total aerosol volume concentration ranged from 21 to 81%. Ice activation was investigated in dynamic expansion experiments simulating cloud cooling rates between about -0.6 and -3.5 K min(-1). At temperatures between 186 and similar to 235 K, uncoated soot particles acted as deposition nuclei at very low ice saturation ratios between 1.1 and 1.3. Above 235 K, ice nucleation only occurred after approaching liquid saturation. Coating with sulfuric acid significantly increased the ice nucleation thresholds of soot aerosol to saturation ratios increasing from similar to 1.3 at 230 K to similar to 1.5 at 185 K. This immersion mode of freezing nucleates ice well below the thresholds for homogeneous freezing of pure sulfuric acid solution droplets measured in previous AIDA experiments. A case study indicated that in contrast to the homogeneous freezing the nucleation rate of the immersion freezing mechanism depends only weakly on relative humidity and thereby the solute concentration. These results show that it is important to know the mixing state of soot and sulfuric acid aerosol particles in order to properly assess their role in cirrus formation.