Binary mixture study of CF$_4$ and CF$_3$Cl on graphite

PETROS THOMAS, DANIEL VELAZQUEZ, GEORGE HESS, University of Virginia — In a binary mixture adsorption study of CF$_4$ and CF$_3$Cl on graphite from 60 K to 105 K, both the CF$_3$Cl - $\nu_4$ and the CF$_4$ - $\nu_3$ frequency shifts are measured using IRAS as the spreading pressure (chemical potential) of CF$_4$ is increased. Even though CF$_3$Cl has a much lower saturation vapor pressure (SVP) compared to CF$_4$ (at 80 K, SVP of CF$_4$ is $\sim$ 70 mT and that of CF$_3$Cl is $\sim$ 0.1 mT), the CF$_4$ either continuously displaces or adsorbs on top of CF$_3$Cl depending on the initial coverage of CF$_3$Cl on the graphite surface. For temperatures between 70 K and 105 K and lower coverage of CF$_3$Cl, where the molecules lie with their C – Cl axis nearly parallel with the surface, CF$_4$ continuously displaces CF$_3$Cl from the surface. For saturated monolayer coverage of CF$_3$Cl, where the C – Cl axis of the molecules are tilted relative to the surface, the CF$_4$ molecules adsorb on top of the CF$_3$Cl – HOPG template. At 60 K, the displacement of the low-coverage CF$_3$Cl is only partial and the orientation of the remaining CF$_3$Cl is tilted relative to the surface from a nearly flat position.

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