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Constraining the composition and surface properties of Saturn's icy moons, using Cassini/CIRS thermal infra-red spectra

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The thermal infrared spectra of several icy satellites seem to have in common the absence of emissivity features. This was the case of Ganymed and Europa, observed by the Galileo spacecraft and also for the icy satellites of Saturn Phoebe, Iapetus, Enceladus, Tethys and Hyperion, recently observed by Cassini/CIRS in the $7\,\mu m - 1\,mm$ range. However, several materials that have been identified in the surface of these bodies present emissivity features in the observed ranges. In particular, water and CO_2ices, have features in the thermal infrared with sufficient contrast to have been detect by CIRS. Here we study the physical cause of the absence of features by simulating the effects of intimate mixtures using models of directional emissivity for optically thick and optically thin surfaces for different particle sizes and abundances. The simulations include a set of materials detected in the surface of the icy satellites, like CO_2 ice, water ice, hydrated silicates and organics.