Impact – Produced Exosphere of Europa

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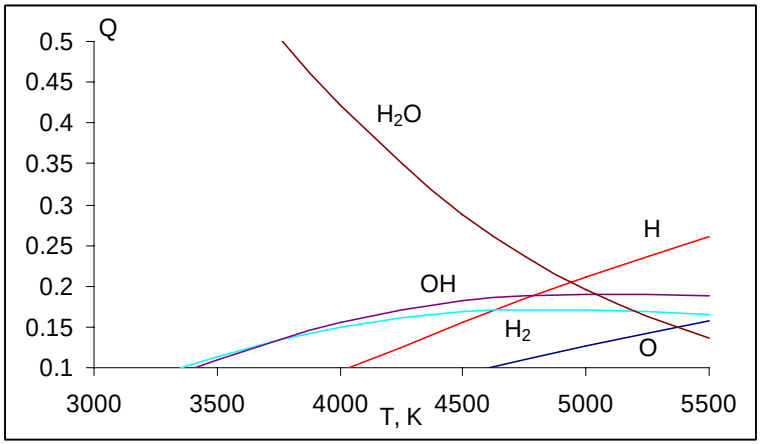
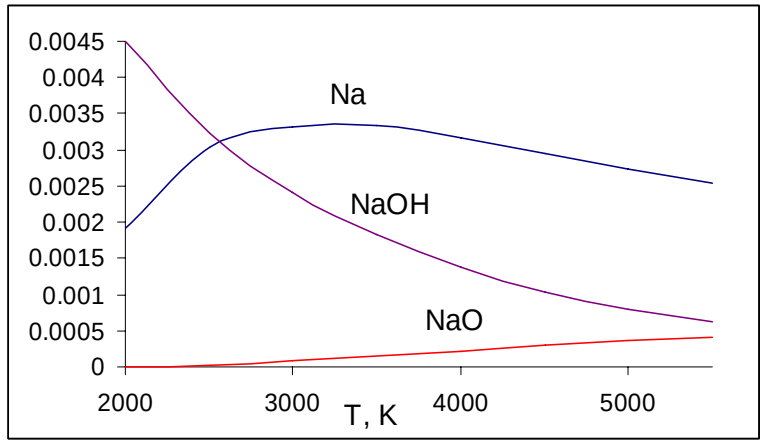
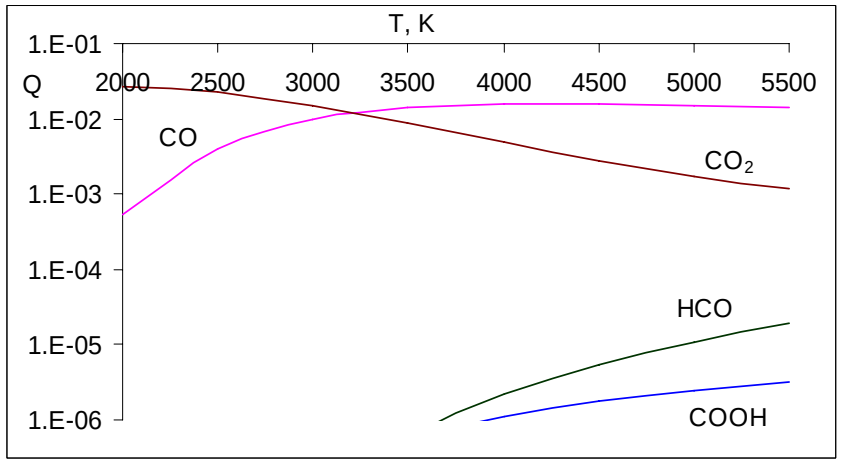
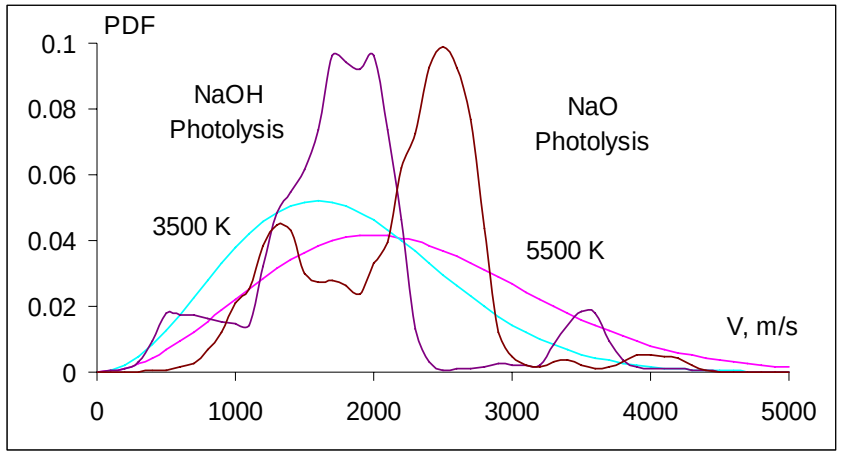
Equilibrium chemical composition of the impact-induced cloud







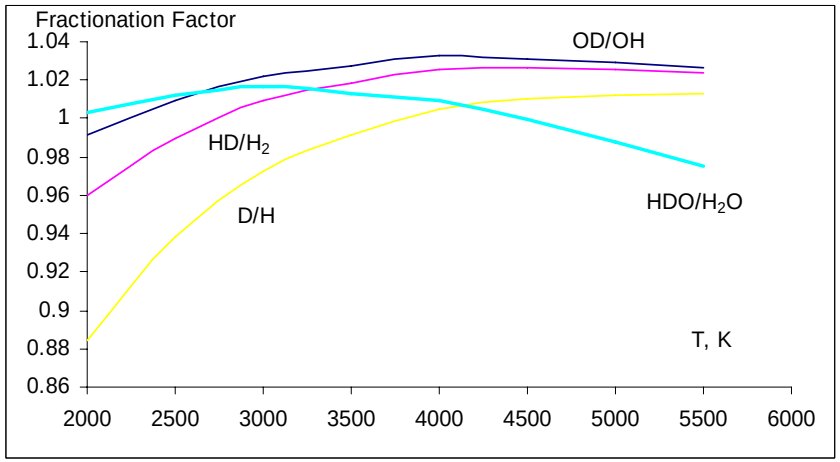
Elements	Impact-generated species	Species detected in the vicinity of Europa	Species in cometary atmospheres	Species detected during SL9 – Jupiter collision (Shulman, 2002)
Na	Na, NaOH	Na	Na (near Sun)	Na
K	KOH, K	K	K (near Sun)	Not observed
C	CO, CO_2	-	CO, CO_2, C_2, CN	CO, CN, C_2 (?), CO^+
H	H_2O, OH, H_2	-	H_2O, OH	NH_2
S	SO_2, SO	-	SO_2, H_2S	S_2
Fe	Fe	-	-	Fe
Mg	Mg, MgO, MgOH	-	-	MgO



Probability density function of photolysis-generated Na atoms

Upper limit of NaO and NaOH photolysis lifetimes on Europa are estimated to be 16 and 4 min, respectively.

Dissociation rates of Na-containing molecules on Europa are determined by photolysis, not by electron impact.



Deuterium exchange factor between the main H-bearing species versus the temperature of the cloud

Conclusions

- Chemical composition of impact-produced clouds on Europa is estimated.
- Properties of photolysis-generated Na atoms are considered.
- Meteoroid bombardment leads to increasing of D/H ratio in water ice and destruction of complex organic compounds on Europa.
- Previous detection of cometary impacts on Europa is very tentative.
- Micrometeoroid source of Europa's exosphere can be studied by mass spectrometers on board future Europa landers.