Formation of amorphous H_2O ice by surface atomic reactions at low temperatures.

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Formation of amorphous H_2O molecules through a codeposition of oxygen molecules and hydrogen atoms is examined at 10-40K under various oxygen and hydrogen fluxes. H_2O and H_2O_2 are continuously formed by the reaction and the formation of both molecules occurs even at 40K. H_2O ice formed in this experiment is amorphous but is expected to have less microporous structure compared to amorphous H_2O ice made by vapor deposition, because the dangling bond is not observed on the IR spectrum. The lack of the dangling bond is consistent with the H_2O ice in molecular clouds. The compositions of the H_2O-H_2O_2 mixed ice (H_2O/H_2O_2) vary with experimental conditions, ranging from 0.1 to 5.3. H_2O/H_2O_2 ratio of the ice generally increases with the decrease of oxygen molecules to hydrogen atoms flux ratio. Our results imply higher H_2O/H_2O_2 ratio of the ice may be obtained under lower O_2/H conditions.