Steam reforming of ethanol for hydrogen production: Thermodynamic analysis including different carbon deposits representation

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The importance of H2 production as an energy carrier in the future has driven the attention to reforming systems, such as steam reforming, partial oxidation or oxidative steam reforming of ethanol, considering thermodynamic and kinetic aspects. Thermodynamics predicts the equilibrium composition of reactants and products at different temperatures. Previous works represent carbon deposition only as graphite formation, because graphite is present in thermodynamic databases and its properties are known. This work aims to describing equilibrium composition for Reforming systems, including carbon deposits represented as graphite, nanotubes and amorphous carbon. The obtained results show formation of carbon species below a steam/ethanol ratio equal to 4.0. This region is divided by the dominance of graphite, below 400 °C; and nanotubes, above 400 °C. Our results indicate that the disappearance of carbon deposits as oxygen/ethanol ratio increses is mainly due to nanotubes removal from equilib