Title:	Sn Doping on Ta2O5 Facilitates Glucose Isomerization for Enriched 5-Hydroxymethylfurfural Production and its True Response Prediction using a Neural Network Model
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Abstract:	Here, we describe the maximum production of 5-HMF using glucose over Sn doped Ta2O5 in a binary solvent system. The analytical characterizations established that Sn4+ in the catalyst interacts with Ta2O5 and offers the Lewis acid sites favorable for glucose isomerization to fructose. Similarly, the Ta2O5 support offers both the Lewis and Brønsted acid sites to promote fructose dehydration to 5-HMF. The catalyst provided favorable conditions for the sequential sugar(s) transformation, i. e., glucose isomerization followed by fructose dehydration, which resulted in a 5-HMF yield as high as 57 % wt. and 80 % selectivity under modest reaction conditions in a water-DMSO system using ST1 (1 % Sn on Ta2O5). The separate fructose to 5-HMF conversion study verified the negligible influence of Sn on the dehydration reaction. Moreover, the catalyst's systematic sugar conversion enabled a >65 % fructose formation, which accounts for the enriched 5-HMF synthesis. The neural network model best represented the 5-HMF data (<4 % MAE for glucose and fructose conversions).
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