Why calcination of catalyst is done at 650 oC?

One of the tasks of the article is to compare the catalytic properties of individual vanadium pentoxide and its mixtures with tin and zirconium oxides in the oxidative ammonolysis of 3,4-dimethylpyridine. We have prepared and tested catalysts (V2O5, V-Zr-O и V-Sn-O) with different calcination temperatures. The melting point of vanadium pentoxide is 690 °C. However, to prevent melting of vanadium pentoxide оptimal temperature of 650 °C was chosen.

Any phase transformation takes place above 650 oC?

The calcination of the catalysts leads to changes in the phase composition.

We have found that SnO2 does not form a chemical compound with V2O5, its promoting effect is due to the influence on the mobility of oxygen in V2O5 (the results of quantum chemical calculations presented in this article are consistent with these conclusions). Moreover, SnO2 can be an oxidizing agent for the lower vanadium oxides and prevent the reducing of a catalyst, thereby stabilizing its composition.

Zirconium divanadate, which affects the mobility of oxygen in V2O5, is formed upon calcination at 650 °C of a mixture of V2O5 and ZrO2. The catalytic effect of the system depends on the ratio of V2O5, ZrV2O7 and ZrO2.

Why authors have not characterized the prepared catalyst by XRD, SEM and EDX?

Earlier, we carried out XRD and IR spectroscopic analysis of the synthesized catalysts. However, the main task of this article is to study the reactivity and the likely mechanism for the transformation of 3,4-dimethylpyridine in oxidative ammonolysis and to establish the reasons for the higher activity of binary systems using quantum chemical calculations.

A detailed study of the prepared catalysts using various physical methods is an interesting topic for further research.