Supported Potassium-Doped Co3O4 Catalysts for N2O Decomposition

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7P-01
VLIV KOLAGENOVÉHO OBALU NA BOBTNAVOST SYNTETICKÉHO HYDROGELU

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V současnosti jsou pro malo- i velkopěstitelské aplikace nabízeny hydrogely na bázi polyakrylátů. Zároveň však probíhá vývoj nových půdních zlepšovačů na přírodní nebo kompositní bázi, které by měly nahradit drahé a mnohdy problematické syntetické produkty používané jako regulátory půdní vláhy zejména v oblastech s nedostatkem srážek .

V prezentované práci byl studován vliv obalu na bázi směsi kolagenu a bentonitu na bobtnavost syntetického hydrogelu. Bentonit byl zvolen pro jeho schopnost bobtnání a pro jeho vysokou kationtovou výměnnou kapacitu, která zlepšuje vlastnosti sorpčního půdního komplexu a zásobování rostlin živinami. Kolagenový materiál rovněž vykazuje určitou bobtnací kapacitu a je po své mineralizaci v půdě zdrojem živin.

Bylo připraveno 30 vzorků o různém složení obalové směsi, k jejíž přípravě byla použita technická želatina nebo králičí kolagen a dále jeden ze tří testovaných bentonitů, jehož obsah se pohyboval v rozmezí 2-25%. Bentonity byly hodnoceny metodami XRD, XRF, DTA a stanovením distribuce velikosti částic[1]. Bobtnavost materiálů byla testována pomocí metody „Tea bag", kdy navážka vzorku je umístena do nylonového sáčku, ponořena do vody a ve zvoleném časovém intervalu je kontrolována její hmotnost[2].

Nejvyšší hodnoty bobtnavosti kompozitního hydrogelu, v němž bylo 89 % syntetické složky nahrazeno kolagen – bentonitovou směsí (cca 40 g vody/g vysušeného hydrogelu) bylo dosaženo u vzorků obsahujících kolem 85 % kolagenu a 4% bentonitu.

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7P-02
EFFECT OF PRECURSOR SYNTHESIS ON CATALYTIC ACTIVITY OF Co_3O_4 IN N_2O DECOMPOSITION

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Series of precursors was prepared by precipitation of cobalt nitrate in aqueous solutions using various precipitation agents ($NH_3.H_2O$, NaOH, Na_2CO_3) and reactions conditions (OH/Co molar ratio, aging time). Powder XRD showed different phase composition of the obtained precursors, in which β-$Co(OH)_2$, Co^{II}-Co^{III} layered double hydroxide, and basic cobalt carbonate were identified. Only Co_3O_4 spinel-like oxide was found in products after heating at 500 °C in air but different N_2O conversions were observed over the examined oxide catalysts. Especially the catalysts obtained from β-$Co(OH)_2$ precursors showed high catalytic activity in N_2O decomposition. The correlation between methods of preparation, phase composition of precursors, catalytic properties of the related oxide catalysts, and the role of the cobalt ions as catalytic active sites is discussed.

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7P-03
SUPPORTED POTASSIUM-DOPED Co_3O_4 CATALYSTS FOR N_2O DECOMPOSITION

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Supported Co_3O_4 catalysts were prepared by heating the cobalt hydroxide synthesized electrochemically on stainless steel sieve and by heating the commercial TiO_2 tablets impregnated with cobalt nitrate solution; the catalysts were then modified with potassium promoter. For comparison, the

grained K-doped Co_3O_4 catalyst was prepared from the precipitated precursor. The catalysts were characterized by various methods and tested in catalytic N_2O decomposition. The specific catalytic activity of the prepared catalysts was related to cobalt content in each sample. The K-doped Co_3O_4 deposited on stainless steel sieves had the highest activity. Mathematic model of ideal plug flow reactor was used for simulation of the pilot-plant reactor for low-temperature N_2O decomposition in off-gas from nitric acid production. Simulation results also showed that the highest conversion should be achieved over the catalyst deposited on stainless steel sieves. Both catalysts testing in laboratory and mathematical modeling demonstrated advantageous use of structured catalysts.

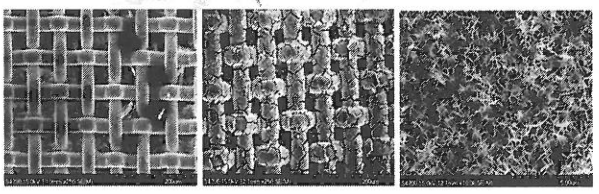

Fig. 1. **SEM images of stainless steel sieve support (left), the sieve with deposited K-doped Co_3O_4 (middle), and detail of the surface of deposited oxide layer (right)**

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7P-04
SUPPORTED Co-Mn-Al MIXED OXIDES AS CATALYSTS FOR N_2O DECOMPOSITION

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The Co-Mn-Al mixed oxide catalysts on different supports (TiO_2, SBA-15, Al_2O_3, SiO_2, MMT, steel slag, granular blast furnace slag) were prepared by pore filling impregnation, characterized by AAS, XRD, TPR-H_2 and N_2 physisorption and tested for N_2O catalytic decomposition in kinetic regime in an inert gas and in the presence of O_2, H_2O and NO. The catalytic properties were compared on the basis of specific activities, related to the amount of cobalt and manganese in each sample. The highest activities were observed over Co-Mn-Al mixed oxide supported on SBA-15 and TiO_2 and the lowest on slags; the same trend was maintained in the presence of H_2O, O_2 and NO. The dependence of the specific activity on the ease of catalyst reducibility was observed, what means that tested supports affected properties of active components.

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