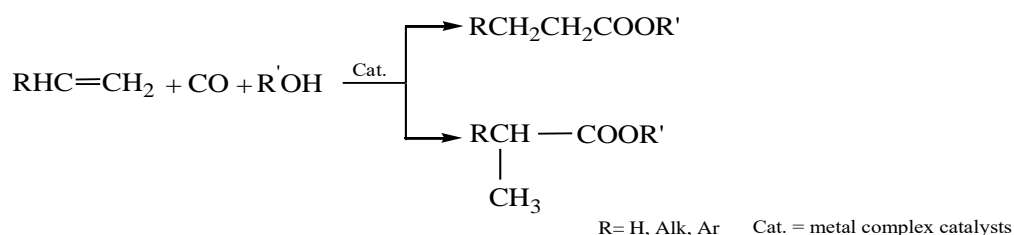


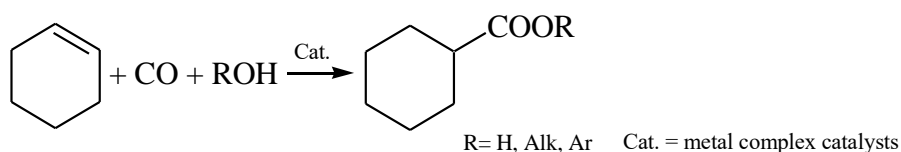
esters of carboxylic acids are mainly linear and α -branched, and synthesized with the participation of catalysts based on metals of group VIII of the Periodic Table [5, 6].



Currently, many studies have been carried out in the field of hydroesterification of alkenes [7–20] and the degree of their transformation and sensitivity has been studied. Works [3, 17] have studied the influence of various factors on carbonylation processes (at 70–95 °C, 1–4 MPa, for 3 hours) of primary alkenes, such as propene, isobutylene, pentene-1, hexene-1, heptene-1, octene-1, and other terminal alkenes in the presence of (PPh₃)₂PdCl₂–SnCl₂ catalysts. Output of obtained esters varies within limits of 70–95, depending on structure of the used catalyst system.

Most of recent researches are focused on the processes of carbonylation of hexene-1, octene-1, decene-1, and dodecene-1. In particular, hexene-1 was carbonylated in the presence of the PdCl₂–6PPh₃–5p-TsOH system at 125 °C and a pressure of 0.8 MPa [18, 19] as well as in the presence of the PdCl₂(PPh₃)₂–PPh₃–AlCl₃ system at 120 °C and a pressure of 2.5 MPa for 5 hours [12]. As a result, 84–93.8 % of the product was obtained with a selectivity of 98 %. In order to increase the selectivity with respect to linear esters, the systems PdCl₂–monophosphine ligand–LiCl–Lewis acid were used in the reaction of hydromethoxycarbonylation of alkenes [20]. The process was found to be influenced by parameters such as CO pressure, solvents and the nature of the catalyst. 1-Dodecene was hydromethoxycarbonylated with a PdCl₂–P(p-C₆H₄–OCH₃)₃–LiCl–SnCl₂ catalyst (T = 110 °C, P_{CO} = 2.4 MPa, 22 h) in a high yield (93 %). The results of the carbonylation of octene-1 and tetradecene-1 in the presence of the same catalytic system were obtained with high efficiency (96 %) within 22 hours. Previous works on the carbonylation of octene-1 together with methanol and CO in the presence of the Pd(CH₃COO)₂–PPh₃–p-TsOH system at 80 °C and a pressure of 2.1 MPa showed a yield of 74 %, and the conversion of the substrate was achieved in 3.5 hours [12]. Most of the studies mentioned above aimed at increasing the yields of linear isomers, which is the main problem in the carbonylation of alkenes, since the practical value of the resulting linear isomer of the product is very high.

Currently, cyclic carboxylic acids and their esters obtained from cycloolefins with carbon monoxide and alcohols or phenols are an important raw material for the synthesis of pharmaceuticals and flavorings. Therefore, more work is underway to find effective catalysts and optimal parameters for their preparation, as well as research on kinetics and thermodynamics [6, 21–29].



Esters of carboxylic acids are widely used in practice as pesticides, solvents in varnishes, dyes, flavours in perfume compositions, additives to various types of fuel, additives to polymeric materials, etc. [30–31]. One of the most important qualities is their use as semi-finished products in chemical and pharmaceutical synthesis [5, 6]. Some esters are components of pharmaceuticals.

Based on the studies of the above literature, it is possible to conclude that the processes of carbonylation of unsaturated compounds, especially olefins, is the most effective method for the synthesis of various organic compounds of great practical importance. Compared to other methods for the production of carboxylic acid esters, hydroalkoxycarbonylation of olefins has a number of advantages, such as single-stage processes, the availability of raw materials, the possibility of influencing the reaction by changing the nature of the metal-complex catalyst and the conditions of the process, which determines that the conduct on an industrial scale is in all respects advantageous.