

group hydrocarbon composition of the products of their thermocatalytic hydrogenation. In this research an attempt of development of resource-saving technology was made for the solution of a problem of complex and harmless utilization of polymeric materials on the basis of worn tires, rubber-containing and plastic waste, polymetallic wastes of metallurgical industries. Composites based on polymetallic wastes of ferroalloy production (WFP) and acid-activated natural zeolite-heulandite-clinoptilolite of Kazakh field Tayzhuzgen were used as catalysts of the process. Previously, the surface and structural properties of composite catalysts were studied using X-ray spectroscopy and X-ray phase analysis.<sup>12</sup>

## RESULTS AND DISCUSSION

Surface and structural properties of composite catalysts based on natural zeolites and WFP were studied using X-ray spectral, X-ray phase analysis and BET method. X-ray phase analysis of catalysts

based on activated zeolite and WFP is presented in Figs. 1-3. According to the given diffractograms of the zeolite, three crystalline phases corresponding to the heulandite of the composition  $\text{Ca}(\text{Ca}_{3,6}\text{K}_{0,8}\text{Al}_{8,8}\text{Si}_{27,4}\text{O}_{72}\cdot 26,1\text{H}_2\text{O})$ , clinoptilolite of the composition  $\text{Ca}(\text{K}, \text{Na}_2\text{Ca}_2(\text{Si}_{29}\text{Al}_7)\text{O}_{72}\cdot 24\text{H}_2\text{O})$  and quartz were identified in them. As follows from the diffractograms of the WFP, alumina and silica are equally present in it, which are manifested in the form of additive signals (Fig. 2). The textural properties of catalysts by the method of adsorption porometry of BET were investigated and their specific surfaces were determined (Table 1).

According to X-ray spectral analysis, in the initial catalysts, metals with variable valence, such as Mn, Ti, Fe, Cr, are present along with Si and Al, which makes them suitable for use in the researched process (Fig. 4, 5).

Thus, it was found that the catalysts under investigation are characterized by the presence of active centers and good texture properties.

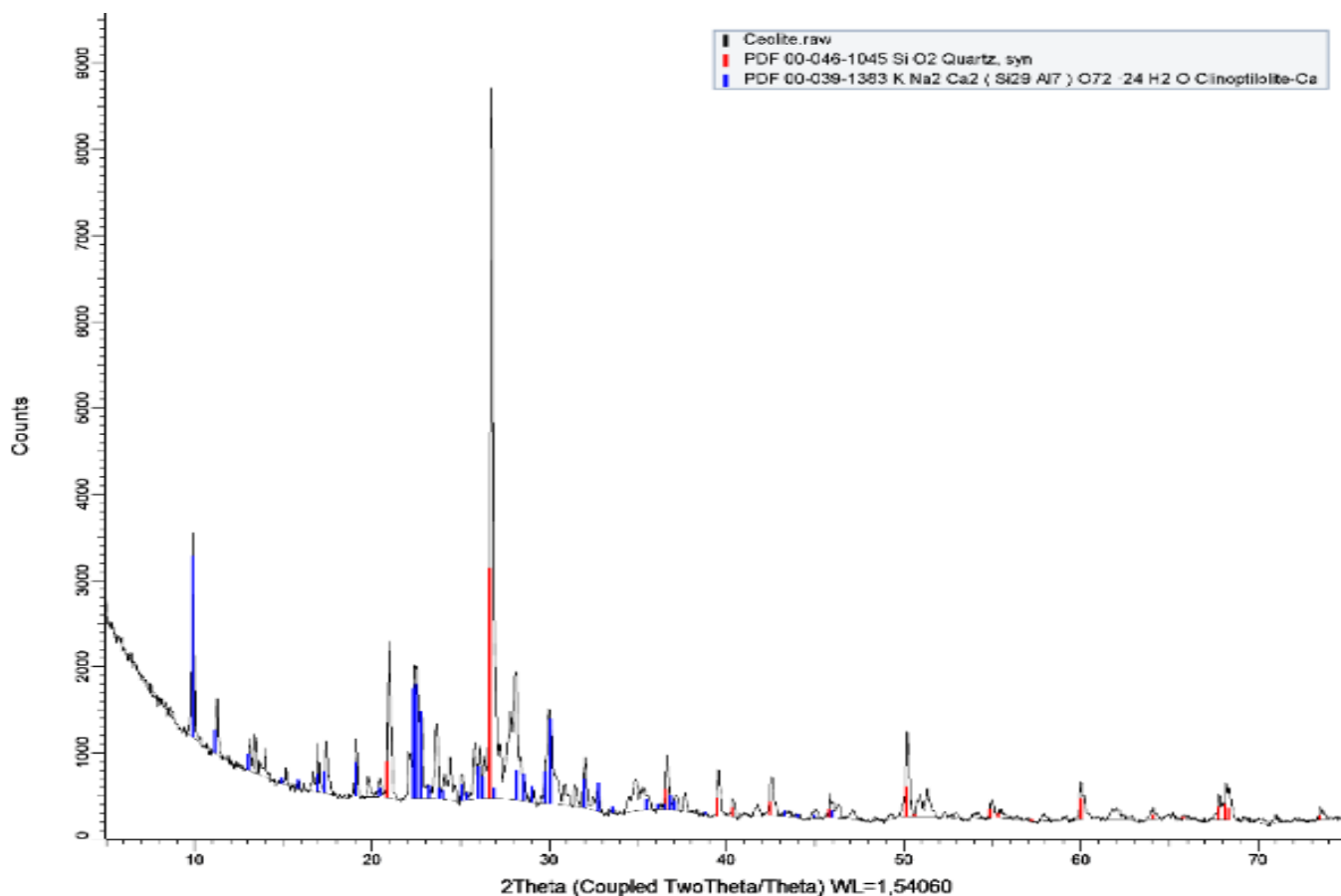


Fig. 1 – Diffractogram of a sample of zeolite with the detection of clinoptilolite and quartz.