Photocatalytic fluidized beds are used for water and air purification processes involving light, which activates the photocatalyst and initiates radical processes and then decomposition reactions of organic pollutants. A fluidized bed consists of a support and a photocatalyst attached to its surface. The advantage of using fluidized beds is that the contact between the active reagent, i.e. the photocatalyst, and the treated medium (gas, water) is increased. The kinetics of photocatalytic processes depends on the processes of diffusion of the pollutant to the surface of the photocatalyst, the efficiency of formation of reactive radicals and the rate of removal of the generated reaction products. The disadvantage of fluidized bed processes is that in order to obtain the fluidized state of the bed, it is necessary to use an appropriate gas flow rate, which is determined by the type of bed and the design of the reactor. Sometimes it happens that the applied gas flow rate through the fluidized bed reactor in the fluidized state is so high that it causes a significant decrease in the efficiency of photocatalytic processes. In the proposed research, it is planned to use a bed with ferromagnetic properties, which would be fluidized in a magnetic field. An externally generated magnetic field, e.g. with the help of permanent neodymium magnets, which are situated outside the reactor, could be used to control the fluidization process of the bed. A very good material for the prepration of a magnetic fluidized bed is nickel foam, which has ferromagnetic properties and a porous surface. Preliminary studies of the process of photocatalytic decomposition of acetaldehyde on a composite composed of nickel foam and TiO_2 under UV irradiation have shown an increase in the efficiency of the process from 33 to 50% at 25°C and from 40 to 88% at 100°C with a simultaneous improvement in the degree of mineralization of intermediate products. Such a significant improvement in process performance was the result of the synergistic interaction of nickel foam and TiO_2, which was that the generated electrons in TiO_2 flowed into Ni, and the separated electron gaps could participate in the oxidation reaction of acetaldehyde. Thus, the separation of charge carriers in TiO_2 (electrons-electron gaps) was a key parameter responsible for the significant improvement in the decomposition of acetaldehyde. In the conducted studies, powder TiO_2 applied to the surface of nickel foam was used. Literature reports indicate that 3D nanostructures, i.e. ZnO or TiO_2 nanorods, exhibit piezoelectric properties in a magnetic field, which contribute to improving the separation of charge carriers. Therefore, in the proposed solution, it is planned to obtain composite materials, i.e. Ni foam/TiO_2 nanorods, in order to see if an additional effect will be obtained to improve the charge carrier separation of these composites used as a fluidized bed, stabilized by a magnetic field. These materials will be compared with a composite made of nickel foam and TiO_2 with a 2D structure. The nickel foam has Vis and IR absorption properties. In the proposed project, it is planned to investigate the effect of UV-Vis and UV-Vis/IR absorption on the photocatalytic effect of the obtained materials. Absorption of IR radiation by nickel foam can increase the reaction temperature and increase the decomposition rate of acetaldehyde. The obtained composite materials will also be tested for photocurrent generation. The effect of increasing the current conductivity of the nickel foam through electron transfer from TiO_2 to Ni is expected. The obtained new nanostructures will have ferromagnetic and photocatalytic functions and can successfully find application in various processes. The multifunctionality of the obtained nanostructures can bring elements of novelty to the development of disciplines, i.e. materials, chemical and environmental engineering.