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Experimental setup for elemental analysis using prompt gamma rays at research reactor IBR-2

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The new experimental setup has been built at the 11b channel of the IBR-2 research reactor at FLNP, JINR, to study the elemental composition of samples by registration of prompt gamma emission during thermal neutron capture. The setup consists of a curved mirror neutron guide and a radiation-resistant HPGe high-purity germanium detector. The detector is surrounded by lead shielding to suppress the natural background gamma level. The sample is placed in a vacuum channel and surrounded by a LiF shield to suppress the gamma background generated by scattered neutrons. This work presents characteristics of the experimental setup. An example of hydrogen concentration determining in a diamond powder made by detonation synthesis is given and on its basis, the sensitivity of the setup is calculated being $\sim 4\mu\text{g}$.

Summary

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