CLAIMS

1. Photodetector (1) adapted to detecting a light radiation in a predefined detection spectral band, comprising a stack formed of:
   - a support layer (10), made of a transparent material, adapted to receiving the light radiation from a front side (10av) and to transmitting it through a back side (10ar);
   - a grating structure (20), arranged on the back side (10ar) of the support layer (10), comprising patterns (22.1) arranged in a main plane parallel to the front side (10av) of the support layer (10);
   - an active layer (30), arranged on a back side (20ar) of the grating structure (20), made of a semiconductor material adapted to absorbing the light radiation;

   characterized in that:
   - the grating structure (20) comprises a structured layer (22), which is formed of said patterns (22.1) and of a continuous sub-layer (22.2) of non-zero constant thickness e_{ccs}, the patterns (22.1) facing the support layer (10) and having a profile widening along a direction towards the continuous sub-layer (22.2);
   - the grating structure (20), referred to as photonic crystal structure, has dimensions such that the structured layer (22) forms a photonic crystal which supports at least one guided mode capable of being excited by the incident light radiation of interest, the photonic crystal being optically coupled to the active layer (30) so that the guided mode is optically confined in the structured layer (22) and the active layer (30).

2. Photodetector (1) according to claim 1, wherein the patterns (22.1) have a height h, between their top and their base, in the range from one tenth to three quarters of the thickness e_{ccs} of the continuous sub-layer (22.2) of the structured layer (22).

3. Photodetector (1) according to claim 1 or 2, wherein the photonic crystal structure (20) comprises a filling layer (21), located between the support layer (10) and the structured layer (22), made of a dielectric material having a refraction index n_L smaller than a refraction index n_H of the structured layer (22) and exhibiting a difference n_H-n_L at least equal to 0.2.

4. Photodetector (1) according to claim 3, wherein the refraction index n_L of the filling layer (21) exhibits a difference in absolute value $|n_L-n_{cs}|$ with a refraction index n_{cs} of the support layer (10) at most equal to 0.1.

5. Photodetector (1) according to any of claims 1 to 4, wherein a refraction index n_H of the structured layer (22) exhibits a difference in absolute value $|n_H-n_{ca}|$ with a refraction index n_{ca} of the active layer (30) at most equal to 0.5.

6. Photodetector (1) according to any of claims 1 to 5, wherein the sum of a height h of the patterns (22.1), of a thickness e_{ccs} of the continuous sub-layer (22.2) of the structured layer (22), and of a thickness e_{ca} of the active layer (30) is at least equal to $\lambda_r/(2\times\langle n'_H\rangle)$, where λ_r is a wavelength of the guided mode, and where $\langle n'_H\rangle$ is an average index equal to an average of the refraction indices of the structured layer (22) and of the active layer (30) weighted by the respective thicknesses.

7. Photodetector (1) according to any of claims 1 to 6, wherein the patterns (22.1) have a parabolic profile.

8. Photodetector (1) according to any of claims 1 to 7, wherein the active layer (30) has a back side opposite to the photonic crystal structure (20), in contact with vacuum.

9. Photodetector (1) according to any of claims 1 to 8 and of claim 3, wherein the filling layer (21) is made of an oxide.

10. Photodetector (1) according to claim 9, wherein the filling layer (21) is made of a silicon oxide.

11. Photodetector (1) according to any of claims 1 to 10, wherein the active layer (30) is a photoemissive layer made of a material based on SbNaKCs, $SbNa_2KCs$, SbNaK, SbKCs, SbRbKCs, or SbRbCs, or of a material based on AgOCs.

12. Photodetector (1) according to any of claims 1 to 11, the photodetector being an image intensifier tube or a photomultiplier tube.

13. Method of manufacturing the photodetector (1) according to any of the foregoing claims, comprising the following steps:

- forming of a stack formed of a thick layer (40), of a filling layer (21), and of an upper thin film (41);
- forming of through openings (43) in the upper thin film (41) and emerging onto the filling layer (21), regularly arranged at pitch p of the patterns (22.1);
- partial isotropic wet etching of the filling layer (21) from the through openings (43), to form periodic etch areas (44) intended to form the patterns (22.1); and then removal of the upper thin film (41);
- deposition on the filling layer (21) of a layer (22) forming the structured layer;
- deposition on the structured layer (22) of the active layer (30);
- removal of the thick layer (40), and assembly of the support layer (10) on the exposed surface of the filling layer (21).