security document on the first side 11. The second cover layer 102 is the outermost layer of the security document on the second side 12. The first pattern 31 is located between the base layer 100 and the first cover layer 101. The second pattern 32 is located between the base layer 100 and the second cover layer 102. Therefore the second pattern 32 is located closer to the second side 12 than the first pattern 31. The first pattern 31 and the second pattern 32 overlap such that the overlapping area defines a shape of the security pattern 40.

The first pattern 31 comprises first single fluorescent substance adapted to emit first visible light 61. The second pattern 32 comprises second single fluorescent substance adapted to emit second visible light 62, the second visible light been different from the first visible light 61. In this embodiment the first visible light 61 is red, and the second visible light 62 is blue.

Figure 7 shows the excitation spectra of the first pattern 31 and the second pattern 32. In the embodiment shown in Figure 7 the frequency of the first excitation radiation 51 is 302 nm and the frequency of the second excitation radiation 52 is 365 nm. Those frequencies are widely used in the field of document authentication. Both the first pattern 31 and the second pattern 32 have an excitation spectrum which has a substantially lower value at a frequency of the first excitation radiation 51 than at a frequency of the second excitation radiation 52. The excitation spectrum of the second pattern 32 has a substantially higher value than the excitation spectrum of the first pattern 31 at the frequency of the second excitation radiation 52. At the frequency of the first excitation radiation 51 the value of the excitation spectrum of the first pattern 31 is substantially the same as the value of the excitation spectrum of the second pattern 32. Further, at the frequency of the first excitation radiation 51 the values of both the excitation spectrum of the first pattern 31 and the excitation spectrum of the second pattern 32 are substantially smaller than the value of the excitation spectrum of the first pattern 31 at the frequency of the second excitation radiation 52.

An appropriate shape of an excitation spectrum is achieved by selecting a suitable single fluorescent substance. A height of the excitation spectrum may be adjusted by changing a concentration of the single fluorescent substance in a colouring agent forming a corresponding pattern. For example, it is possible to use a second single fluorescent substance whose excitation spectrum is lower than an excitation spectrum of the first single fluorescent

CLAIMS

1. A security document having a first side (11) and a second side (12), the security document comprising a first pattern (31) and a second pattern (32) located closer to the second side (12) than the first pattern (31), the first pattern (31) and the second pattern (32) overlapping such that the overlapping area defines a shape of a security pattern (40), the security pattern (40) being adapted to be irradiated with an excitation radiation from at least direction of the first side (11), **characterized** in that the first pattern (31) comprises first single fluorescent substance adapted to emit first visible light (61), and the second pattern (32) comprises second single fluorescent substance adapted to emit second visible light (62), both the first pattern (31) and the second pattern (32) having an excitation spectrum which has a substantially lower value at a frequency of a first excitation radiation (51) than at a frequency of a second excitation radiation (52), the excitation spectrum of the second pattern (32) having a substantially higher value than the excitation spectrum of the first pattern (31) at the frequency of the second excitation radiation (52), the security pattern (40) having a first transmittivity coefficient (I-I) for the first side (11) and the first excitation radiation (51), and a second transmittivity coefficient (I-II) for the first side (11) and the second excitation radiation (52) selected in such a relation to the values of the excitation spectra of the first pattern (31) and the second pattern (32) that when the security pattern (40) is irradiated from the direction of the first side (11) the first visible light (61) dominates the second visible light (62) at the first excitation radiation (51) and the second visible light (62) dominates the first visible light (61) at the second excitation radiation (52).

2. A security document according to claim 1, **characterized** in that at the frequency of the first excitation radiation (51) a difference between a value of the excitation spectrum of the first pattern (31) and a value of the excitation spectrum of the second pattern (32) is substantially smaller than the difference between a value of the excitation spectrum of the first pattern (31) and a value of the excitation spectrum of the second pattern (32) at the frequency of the second excitation radiation (52).

3. A security document according to claim 2, **characterized** in that at the frequency of the first excitation radiation (51) the value of the excitation spectrum of the first pattern (31) is substantially the same as the value

of the excitation spectrum of the second pattern (32).

4. A security document according to any one of claims 2 to 3, **characterized** in that the security pattern (40) is adapted to be irradiated with an excitation radiation also from the direction of the second side (12).

5. A security document according to claim 4, **characterized** in that the security pattern (40) has a third transmittivity coefficient (II-I) for the second side (12) and the first excitation radiation (51), the third transmittivity coefficient (II-I) being selected in such a relation to the values of the excitation spectra of the first pattern (31) and the second pattern (32) that when the security pattern (40) is irradiated from the direction of the second side (12) at the first excitation radiation (51) the second visible light (62) dominates the first visible light (61).

6. A security document according to claim 5, **characterized** in that each one of the first transmittivity coefficient (I-I), the second transmittivity coefficient (I-II) and the third transmittivity coefficient (II-I) is in the range of 10 to 60 %.

7. A security document according to any one of preceding claims, **characterized** in that the security pattern (40) is substantially transparent with respect to the first visible light (61) and the second visible light (62).

8. A security document according to any one of preceding claims, **characterized** in that the first visible light (61) is red, and the second visible light (62) is blue.

9. A security document according to any one of preceding claims, **characterized** in that the first excitation radiation (51) has a frequency in the range 292 to 312 nm, and the second excitation radiation (52) has a frequency in the range 355 to 375 nm.

10. A method of manufacturing a security document, the security document having a first side (11) and a second side (12), the method comprising steps of:

forming a first pattern (31) using a first colouring agent comprising first single fluorescent substance adapted to emit first visible light (61);

forming a second pattern (32) using a second colouring agent comprising second single fluorescent substance adapted to emit second visible light (62) different from the first visible light (61), the second pattern (32) being located closer to the second side (12) than the first pattern (31), the second pattern (32) further being positioned such that the first pattern (31) and the

second pattern (32) overlap and the overlapping area defines a shape of a security pattern (40);

characterized in that both the first pattern (31) and the second pattern (32) have an excitation spectrum which has a substantially lower value at a frequency of a first excitation radiation (51) than at a frequency of a second excitation radiation (52), the excitation spectrum of the second pattern (32) having a substantially higher value than the excitation spectrum of the first pattern (31) at the frequency of the second excitation radiation (52), the security pattern (40) having a first transmittivity coefficient (I-I) for the first side (11) and the first excitation radiation (51), and a second transmittivity coefficient (I-II) for the first side (11) and the second excitation radiation (52) selected in such a relation to the values of the excitation spectra of the first pattern (31) and the second pattern (32) that when the security pattern (40) is irradiated from the direction of the first side (11) the first visible light (61) dominates the second visible light (62) at the first excitation radiation (51) and the second visible light (62) dominates the first visible light (61) at the second excitation radiation (52).

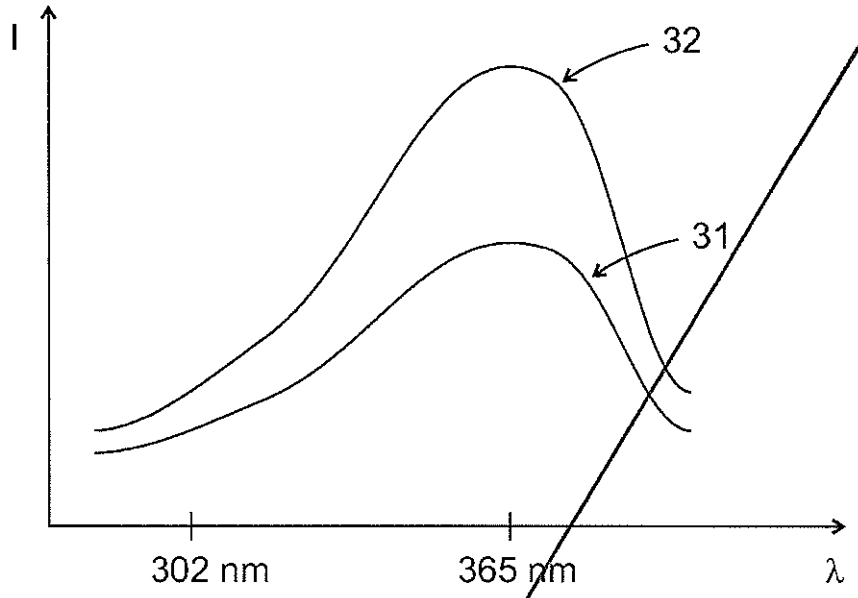

Fig. 7

security document on the first side 11. The second cover layer 102 is the outermost layer of the security document on the second side 12. The first pattern 31 is located between the base layer 100 and the first cover layer 101. The second pattern 32 is located between the base layer 100 and the second cover layer 102. Therefore the second pattern 32 is located closer to the second side 12 than the first pattern 31. The first pattern 31 and the second pattern 32 overlap such that the overlapping area defines a shape of the security pattern 40.

The first pattern 31 comprises first single fluorescent substance adapted to emit first visible light 61. The second pattern 32 comprises second single fluorescent substance adapted to emit second visible light 62, the second visible light been different from the first visible light 61. In this embodiment the first visible light 61 is red, and the second visible light 62 is blue.

Figure 7 shows the excitation spectra of the first pattern 31 and the second pattern 32. In the embodiment shown in Figure 7 the frequency of the first excitation radiation 51 is c/302 nm and the frequency of the second excitation radiation 52 is c/365 nm. Those frequencies are widely used in the field of document authentication. Both the first pattern 31 and the second pattern 32 have an excitation spectrum which has a substantially lower value at a frequency of the first excitation radiation 51 than at a frequency of the second excitation radiation 52. The excitation spectrum of the second pattern 32 has a substantially higher value than the excitation spectrum of the first pattern 31 at the frequency of the second excitation radiation 52. At the frequency of the first excitation radiation 51 the value of the excitation spectrum of the first pattern 31 is substantially the same as the value of the excitation spectrum of the second pattern 32. Further, at the frequency of the first excitation radiation 51 the values of both the excitation spectrum of the first pattern 31 and the excitation spectrum of the second pattern 32 are substantially smaller than the value of the excitation spectrum of the first pattern 31 at the frequency of the second excitation radiation 52.

An appropriate shape of an excitation spectrum is achieved by selecting a suitable single fluorescent substance. A height of the excitation spectrum may be adjusted by changing a concentration of the single fluorescent substance in a colouring agent forming a corresponding pattern. For example, it is possible to use a second single fluorescent substance whose excitation spectrum is lower than an excitation spectrum of the first single fluorescent

CLAIMS

1. A security document having a first side (11) and a second side (12), the security document comprising a first pattern (31) and a second pattern (32) located closer to the second side (12) than the first pattern (31), the first pattern (31) and the second pattern (32) overlapping such that the overlapping area defines a shape of a security pattern (40), the security pattern (40) being adapted to be irradiated with an excitation radiation from at least direction of the first side (11), **characterized** in that the first pattern (31) comprises first single fluorescent substance adapted to emit first visible light (61), and the second pattern (32) comprises second single fluorescent substance adapted to emit second visible light (62), both the first pattern (31) and the second pattern (32) having an excitation spectrum which has a substantially lower value at a frequency of a first excitation radiation (51) than at a frequency of a second excitation radiation (52), the excitation spectrum of the second pattern (32) having a substantially higher value than the excitation spectrum of the first pattern (31) at the frequency of the second excitation radiation (52), the security pattern (40) having a first transmittivity coefficient (I-I) for the first side (11) and the first excitation radiation (51), and a second transmittivity coefficient (I-II) for the first side (11) and the second excitation radiation (52) selected in such a relation to the values of the excitation spectra of the first pattern (31) and the second pattern (32) that when the security pattern (40) is irradiated from the direction of the first side (11) the first visible light (61) dominates the second visible light (62) at the first excitation radiation (51) and the second visible light (62) dominates the first visible light (61) at the second excitation radiation (52).

2. A security document according to claim 1, **characterized** in that at the frequency of the first excitation radiation (51) a difference between a value of the excitation spectrum of the first pattern (31) and a value of the excitation spectrum of the second pattern (32) is substantially smaller than the difference between a value of the excitation spectrum of the first pattern (31) and a value of the excitation spectrum of the second pattern (32) at the frequency of the second excitation radiation (52).

3. A security document according to claim 2, **characterized** in that at the frequency of the first excitation radiation (51) the value of the excitation spectrum of the first pattern (31) is substantially the same as the value

of the excitation spectrum of the second pattern (32).

4. A security document according to any one of claims 2 to 3, **characterized** in that the security pattern (40) is adapted to be irradiated with an excitation radiation also from the direction of the second side (12).

5. A security document according to claim 4, **characterized** in that the security pattern (40) has a third transmittivity coefficient (II-I) for the second side (12) and the first excitation radiation (51), the third transmittivity coefficient (II-I) being selected in such a relation to the values of the excitation spectra of the first pattern (31) and the second pattern (32) that when the security pattern (40) is irradiated from the direction of the second side (12) at the first excitation radiation (51) the second visible light (62) dominates the first visible light (61).

6. A security document according to claim 5, **characterized** in that each one of the first transmittivity coefficient (I-I), the second transmittivity coefficient (I-II) and the third transmittivity coefficient (II-I) is in the range of 10 to 60 %.

7. A security document according to any one of preceding claims, **characterized** in that the security pattern (40) is substantially transparent with respect to the first visible light (61) and the second visible light (62).

8. A security document according to any one of preceding claims, **characterized** in that the first visible light (61) is red, and the second visible light (62) is blue.

9. A security document according to any one of preceding claims, **characterized** in that the first excitation radiation (51) has a frequency in the range c/292 to c/312 nm, and the second excitation radiation (52) has a frequency in the range c/355 to c/375 nm.

10. A method of manufacturing a security document, the security document having a first side (11) and a second side (12), the method comprising steps of:

forming a first pattern (31) using a first colouring agent comprising first single fluorescent substance adapted to emit first visible light (61);

forming a second pattern (32) using a second colouring agent comprising second single fluorescent substance adapted to emit second visible light (62) different from the first visible light (61), the second pattern (32) being located closer to the second side (12) than the first pattern (31), the second pattern (32) further being positioned such that the first pattern (31) and the

second pattern (32) overlap and the overlapping area defines a shape of a security pattern (40);

characterized in that both the first pattern (31) and the second pattern (32) have an excitation spectrum which has a substantially lower value at a frequency of a first excitation radiation (51) than at a frequency of a second excitation radiation (52), the excitation spectrum of the second pattern (32) having a substantially higher value than the excitation spectrum of the first pattern (31) at the frequency of the second excitation radiation (52), the security pattern (40) having a first transmittivity coefficient (I-I) for the first side (11) and the first excitation radiation (51), and a second transmittivity coefficient (I-II) for the first side (11) and the second excitation radiation (52) selected in such a relation to the values of the excitation spectra of the first pattern (31) and the second pattern (32) that when the security pattern (40) is irradiated from the direction of the first side (11) the first visible light (61) dominates the second visible light (62) at the first excitation radiation (51) and the second visible light (62) dominates the first visible light (61) at the second excitation radiation (52).

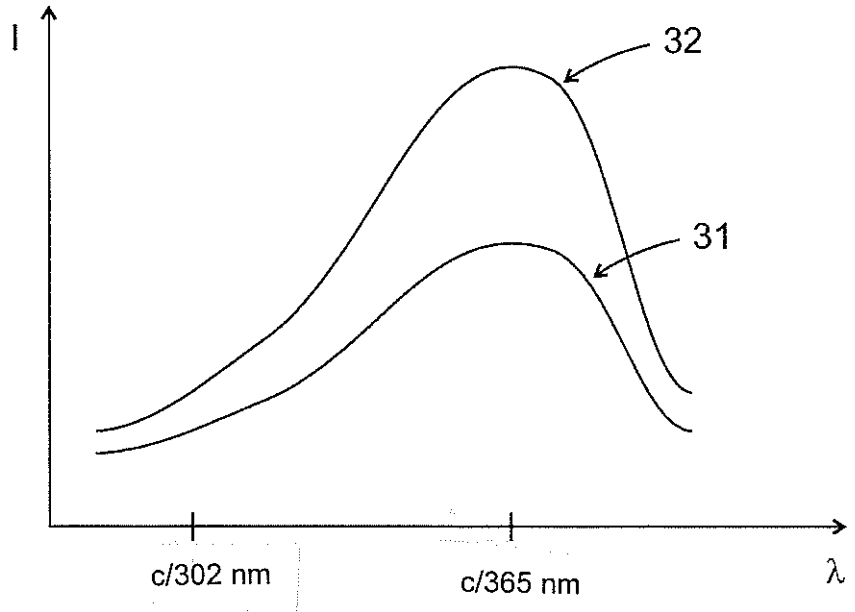

Fig. 7