DANNALAB

Application note 0010

Transdermal patch

XRPD characterisation of API form within transdermal patch

The state of API with the transdermal delivery route is an important factor influencing the amount and release time profile of the delivered substance.

The transdermal patch made of the novel dopamine-receptor agonist delivered through a polymer-based matrix is currently available on the market.

The product is available as patch designed for the release of dose of API over the period of 24h.

While API state within the patch is expected to be amorphous, some of the actual production patches have been exhibiting the signs of API re-crystallization.

Appearance of tiny white deposits within the borders of the patch pointed to possible appearance of crystalline impurities of API (Figure 1).

The aim of this study was to identify, perhaps by combination of different techniques, geometry and possible triggering factors initiating re-crystallization in the particular parts of the patch.

From analytical prospective, the direct non-destructive identification of the white deposit by the conventional XRPD was hardly possible due to intensive scattering originated by the polymer support.

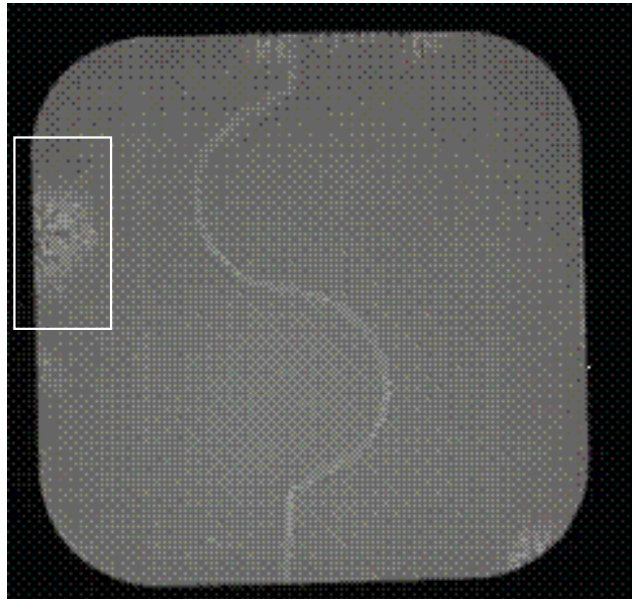

Figure 1. White tiny deposits within the surface of the patch are pointing to possible re-crystallisation of API near the borders

With spatially resolved XRPD we have investigated and compared the areas exhibiting existence of the white spots and areas not showing of any irregularities.

The use of special differentiation technique [1] as a next step allowed us to identify the main substance forming the white deposits as one of the known crystalline polymorph of API (Figure 2).

Investigation of crystalline distribution over the surface allowed coming up with hypothesis – what effect could play the triggering role initiating re-crystallisation of the API within particular areas of the patch.

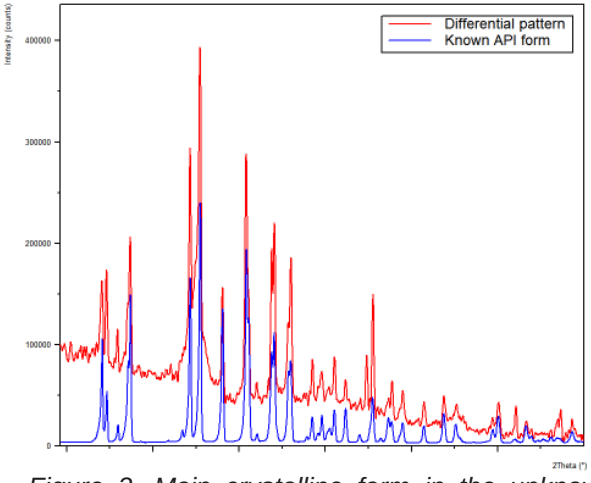

Figure 2. Main crystalline form in the unknown white deposits is identified as one of the known API polymorphs.

At next step, the use of 2D X-ray imaging technique [2] performed with PIXEL QUAD detector (mfg. PANalytical B.V.) allowed to reconstruct the contrast for the areas of recrystallisation (Figure 3).

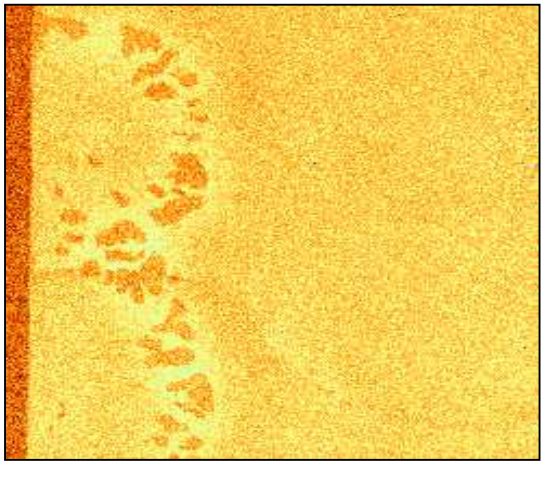

Figure 3. X-ray contrast of crystalline areas

The contrast image revealed the few important features of the process – concentric type of the formations, dense “dark” areas of crystalline deposits and “light” surrounding areas, pointing to the possible mechanism of material transport.

Reference:

[1] “Characterisation of active ingredient in formulation by differentiation of X-ray scattering patterns”; V. Kogan, DANNALAB B.V., presented at IWPCPS-14 symposium on characterisation of pharmaceutical solids.

[2] Measurements kindly by Dr.D.Gotz, PANalytical B.V., Almelo.