

## Examiners' Report on Paper B/1998

This year's Paper B has been deemed straightforward, although a number of candidates did not find it so and provided solutions which could not be defended in a persuasive manner.

The application as presented to the candidates related to a process for manufacturing printed circuit boards comprising three steps: step (a); a treatment to texture the surface of the metallic layer(s) of the printed circuit board; step (b) the bringing into contact of the treated metal surfaces and the surfaces of the insulating layers and step (c) forming the adhesive bonds between the said surfaces. The problem underlying the invention was the somewhat poor adhesive strength between the metal and the insulating surfaces of the printed circuit boards due to the occurrence of "pink rings" or "haloing" at the edges and around perforations in the circuit boards. Electric reliability was also reduced due to this phenomenon. That these problems were solved by the claimed process was shown by the evidence in some of the experimental data provided in the application.

The essential part to be considered in this paper was step (a). It included **three different and alternative embodiments** (first ("one embodiment"), "second" and "still further" embodiments) of chemical treatment to achieve an improvement of the bonding between the metallic layers and the insulating layers. Each of the three embodiments also included a mandatory initial pretreatment step in which the metal surface was mechanically textured or roughened with metal oxide.

In the chemical treatment according to step (a) of the first embodiment, the **metal** surface was exposed to a plasma of fluorohydrocarbons. In the second embodiment, the chemical treatment of the **metal** surface was carried out with an iodine plasma instead. The third or still further embodiment related to oxidative treatments of the pretreated **copper** (Art. -123 (2) EPC !) surface with aqueous alkaline solutions of sodium chlorite "*in accordance with Document I'* (DI) followed by a reducing step using zinc formaldehyde sulphoxylate or sodium hypophosphite or both, at a pH of 1 to 6.

The basis for the expected claims was the **third embodiment** which according to examples 2 and 3 prevents or at least greatly reduces the formation of a "pink ring" or "haloing" and also shows improved peel values.

**Document II (DII)** which anticipated the first embodiment (fluorohydrocarbon plasma after mechanical treatment of the metal surface) was silent with respect to haloing. The same was true for **Document III (DIII)** which anticipated the second embodiment (an iodine plasma was used instead of the fluoro compounds). These facts were set out in points 3 and 4 of the communication. As said in the communication, it was not necessary to read the whole of **DII**. Its example had to be compared with the claims (and with examples 1 and 4 in the application). Only the third embodiment was novel.

Haloing was addressed in **DI** (oxidation with two alkaline sodium chlorite solutions and intermediate etching with a diluted acid), but there was no reference to the mechanical treatment or to the reducing step. The document did not refer to the bond strength (peel value) between metal and substrate either.

The peel values in the examples according to the third embodiment were the best of all data presented in the application. These values could form the basis for a further argument in support of inventive step because the peel value of example 1 (which is the same process as in **DII**) and the peel value of example 4 (which is the same process as in **DIII**)

are worse than those of examples 2 and 3 (the third embodiment).

Apart from the process claim, it was considered possible to gain marks for a copper foil layer obtainable by the mechanical and chemical treatment (including both the oxidising and reducing steps). An argument for a product-by-process claim was not deemed convincing if it was based only on a reference to a different process which would likely result in a different product. The Guidelines C-III, 4.7b are clear in this respect: a product is not patentable simply because it was made in a different process. It was deemed necessary that some argument based on the improved properties was presented to obtain the full marks for this aspect.

The problem to be solved with respect to the prior art was to improve the peel values (adhesion, adhesiveness) and to reduce or prevent haloing (pink ring). This objective problem was the same whether argumentation was started from **DI** or **DII** as closest prior art. There was no evidence that the closest prior art or that any combination of the three citations would solve both aspects and would have led a skilled person to the process including the mechanical pretreatment and the particular oxidation and reducing steps. Moreover, the examples demonstrated that both aspects were solved. In fact, many candidates argued more or less correctly along these lines. Some did not mention both aspects which resulted in some loss of marks.

The following additional points were expected to be considered by the candidates:

As made clear in the description, both a mechanical **and** a chemical treatment in step (a) was required (see the last paragraph on page 5: "... the metal oxide treatment ... is followed by ...").

The process claim had to be limited to copper in view of page 5, line 31 of the description. The description referred to **DI** for details of the oxidising step. In view of the explicit reference to sodium chlorite, this was however no disclosure which would have allowed a generalisation to any oxidising agent. Examples 2 and 3 also demonstrated that the oxidation was carried out with two oxidising solutions of different alkalinity and an intermediate treatment with an acidic solution. This was overlooked by a number of candidates who therefore lost marks.

Due to the anticipation of the particular "plasma" embodiment by **DII**, point 5 of the communication did not require much attention.

If a two-part form of the claims was chosen, it was expected that the two parts complied with Rule 29 (1) EPC. Incorrect distribution of the features to the two parts of such a claim resulted in a loss of some marks.

Some candidates did not limit their claims to the particular two reducing agents and argued that the two compounds were so different that it could be concluded that other reducing agents would do as well. Provided a convincing argument along these lines was presented, these candidates were given credit for such a claim. It was not necessary to limit the reducing step to a particular temperature range or to a particular amount of reducing agent.

Obligatory features should not be put into dependent claims.

An argument to support a claim can only be convincing if it is based on mandatory features of that claim. In any case the claim should be consistent with the description and, in particular, with the examples.

Examples 2 and 3 comprised a twofold oxidation with intermediate treatment with acid (note that the description referred to **DI** in this respect). Limitation to **one** oxidation step in claim 1 reduced the value of examples 2 and 3 for arguing inventive step. Under these circumstances, an argument based on these examples could not be of high value. Moreover, such a limitation to one oxidation step with the intention to further delimit the process from **DI** demonstrated that the document had not been understood. As far as those candidates also put forward the argument that **DI** was not relevant because it required two oxidation steps whereas the presented new claims only referred to one such step, this resulted in an additional loss of marks for the arguments.

Some candidates drafted many dependent claims. This was a waste of time because the marks given for dependent claims were limited. Furthermore, such candidates had to give the basis for all those claims in order to get full marks for the aspect of Art. 123 (2) EPC.

A number of candidates are not yet aware of the detailed explanation of the problem-solution approach in the Guidelines C-IV, 9.5. They simply referred to each document separately. The problem to be solved by the invention over the closest prior art was not identified by many of these candidates. Such an argumentation often resulted in findings or assumptions which were not or not fully supported by the available documents, and the candidates lost marks.

An argument such as "the document does not disclose the particular combination of mechanical and chemical treatments, therefore claim 1 is novel" (applied to each document) or a definition such as "the problem to be overcome was to improve the technology of **DI**" was not considered to be sufficient. The differences between the individual documents and the independent claim and the actual problem (for the solution of which there was evidence) had to be identified to gain the full marks.

Rule 29 (6) EPC requires that a claim shall not rely on references to the description or drawings (see also the Guidelines, C-III, 4.10). This applies, of course, also to a reference in a claim to a different document. As explained in the Guidelines C-II, 4.18, a European patent application should, regarding the essential features of the invention, be self-contained, i.e. capable of being understood without reference to any other document. Therefore a claim referring to **DI** with respect to the particulars of the oxidising steps did not deserve the full marks.

Comments such as "the claim is fully supported by example 2" or "the claim is fully supported by the description" are not really helpful. The first formulation gives rise to the question whether the objections against unallowable amendments as explained in the Guidelines C-VI, 5.4 apply (Is additional information given due to a generalisation?). This argument applies as well to "acidic" instead of "pH of 1 to 6".

Some candidates did not carefully observe the extent of the original disclosure. Some of them mixed up the alternative embodiments. There was however no disclosure in the application which would have formed a proper basis for such combinations of features. They lost a significant amount of marks.

Further examples: The third embodiment was limited to mechanical texturing/roughening of copper, followed by a particular oxidation treatment and by a reducing step. There was no possibility to combine e.g. plasma treatment and the reducing step. Therefore general references to "chemical treatment" and/or to "metal" in claim 1 were no longer possible. Such a claim resulted in a significant loss of marks.

Arguments to support an inventive step of a combination of a mechanical treatment **DII** and a plasma treatment as in **DIII** were not deemed convincing, because it was not evident which problem was indeed solved. Starting from **DII** the problem would have been an alternative process maintaining the level of peel values. This was not achieved as **DII** showed values of up to 15.5 N/cm, the present example 4 resulted in 13.5 N/cm. Alternatively, if the peel value was deemed to be of no importance, **DIII** alone suggested to combine "sandblasting" and I<sub>2</sub>-plasma treatment.

Reference to a cold I<sub>2</sub>-plasma compared to an I<sub>2</sub>-plasma used at 20°C prepared with an I<sub>2</sub>-source of 30°C was not deemed a proper delimitation from **DIII**. On page 5, it was said that in the second embodiment the pressures and temperatures were similar to those in the first embodiment, which meant "room temperature (e.g. 20°C) up to 50°C". A different meaning of "cold" could not be derived from this passage (such as "≤ room temperature") and example 4 could not help in this respect either. Such a claim could not gain any marks.

Some candidates referred in their wording of a process claim to product features such as "... having a peel value of at least 16 N/cm ..." Apart from the facts that the value was nowhere disclosed in the application (= additional information as explained in the Guidelines C-VI, 5.4) and that such a physically measured value is not an absolute value but that it always depends on the marginal conditions of the measurement and is therefore meaningless in the absence of a definition of these conditions, a process should not be defined in terms of a desirable property of the product but in terms of the steps to be carried out (Guidelines C-III, 4.7). Such a claim lost marks.

Claims to the use of the embodiments known from **DII** or **DIII** for the reduction of haloing could not gain marks, because there was no evidence that the problem was indeed solved in the whole range of the claims (see Decisions T 939/92, OJ 6/1996, 309 - 330, T 583/93, OJ 9/1996, 496 - 519). Such claims were based on pure speculation (see Guidelines C-III, 6 *et seq.*).

If candidates referred to sodium chloride instead of sodium chlorite, this was taken as an obvious clerical error in the present context (Rule 88 EPC).

As in previous years, it should be clear from these comments that one essential point for a good reply was consistency between claims and arguments. It was seen as well that taking features out of their proper context often resulted in generalisations which contravened Art. 123 (2) EPC. An example: a pressure range of 0.3 to 0.7 hPa to be used in a I<sub>2</sub>-plasma treatment. The 0.7 limit was said to come from page 5, third paragraph ("below 0.700 hPa") and the 0.3 value from example 1 (for the fluorohydrocarbon plasma treatment, which is in striking contradiction to the pressure in example 4: 3.5 mPa).