# SILICONE PRESSURE-SENSITIVE ADHESIVES WITH IMPROVED THERMAL RESISTANCE

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## Introduction

Pressure sensitive-adhesives (PSA) can be defined as a special category of adhesive which are used for the production of a variety of materials, such as mounting tapes, labels, protective films, masking tapes, bandages, tape operations and biomedical electrodes. For commercially used PSA systems with excellent performance levels, synthetic polymers based on acrylics, silicones, polyurethanes, and polyesters, EVA, polyether, rubbers are preferred. These technologies exist in the market of PSA nowadays [1-3].

Silicone pressure-sensitive adhesives are usually comprised of high-molecular-weight silanol-functional silicone polymers and silanol-functional MQ siloxane resins. It is well known that silicone adhesives are products of special use. Combination of the unique properties of silicones, such as high Si–O–Si backbone flexibility, low intermolecular interactions, low surface tension, excellent thermal stability and high UV transparency, often explains why silicone PSAs have superior performance at high- and low-temperature extremes, excellent electrical properties, chemical resistance and outstanding weathering resistance. It makes they superior compared to organic PSAs [3-6].

## Preparation of self-adhesive tape with improved thermal resistance

Material used: silicone PSA produced of Momentive, USA (PSA 529, PSA 590) and Dow Corning, USA (Q2-7566); dichlorobenzoyl peroxide (DCIBPO) product of Peroxid-Chemie was used as a crosslinking agent. Selected silicone pressure-sensitive adhesive composition with crossiinking agent was mixed with filler to obtain homorganic composition containing 50 wt. % polymer. Nanokaolin was add in 1, 3, 5, or 7 wt. % acording to polymer content. Subsequently, PSA was coated (5 cm/s, ca. 45 g/m$^2$) on polyester film (50 µm), dried for 10 min at 110°C in drying canal. Thus obtained adhesive films secured with a polyester film (36 µm). Prepared self-adhesive tapes were tested according to international standard AFERA 4001, AFERA 4015 and FINAT (FTM 8).

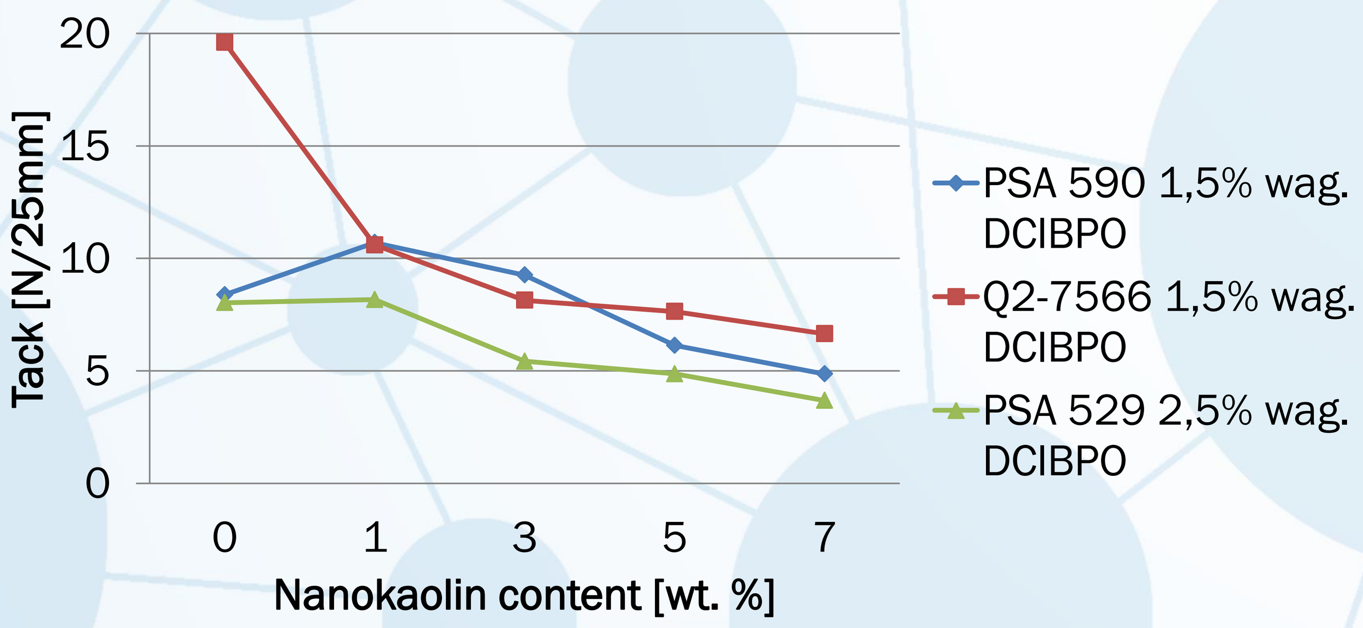


**Fig. 1** Tack of silicone PSA coutaining various amout of nanokaolin

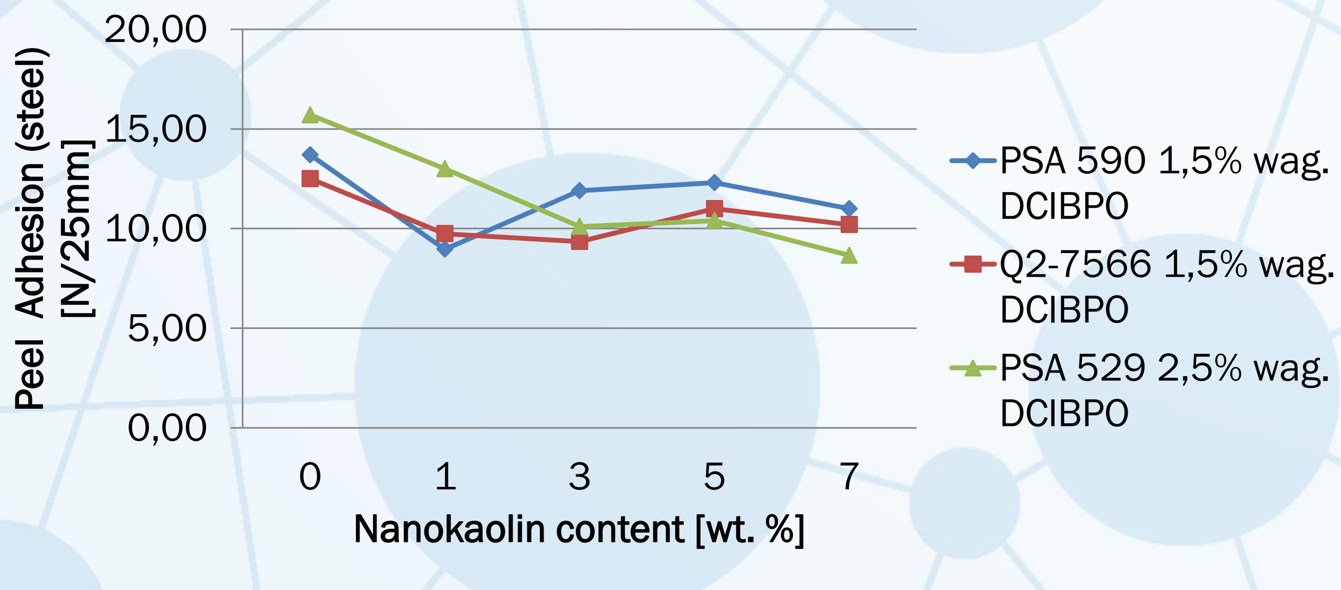


**Fig.2** Adhesion of silicone PSA coutaining various amout of nanokaolin

**Tab. 1** Cohesion, expressed as a time need to cohesion failure and maximum temperature work at silicone PSA containing various amount of nanokaolin

| Adhesive composition | Nanokaolin content [wt. %] | Cohesion [h] | | Maximum temperature work [°C] |
|---|---|---|---|---|
| | | *20 °C* | *70 °C* | |
| PSA 590 1,5 wt.% DCIBPO | 0 | >>72 | >>72 | 154,16 |
| | 1 | >>72 | 5,82 | 197,90 |
| | 3 | >>72 | 6,23 | 212,30 |
| | 5 | >>72 | 9,35 | 231,36 |
| | 7 | >>72 | 8,37 | 246,48 |
| PSA Q2-7566 1,5 wt.% DCIBPO | 0 | >>72 | >>72 | 133,24 |
| | 1 | >>72 | >>72 | 146,50 |
| | 3 | >>72 | >>72 | 222,53 |
| | 5 | >>72 | >>72 | 225,46 |
| | 7 | >>72 | >>72 | 219,82 |
| PSA 529 2,5 wt.% DCIBPO | 0 | >>72 | >>72 | 110,16 |
| | 1 | >>72 | >>72 | 165,02 |
| | 3 | >>72 | 1,72 | 221,24 |
| | 5 | >>72 | 1,22 | 221,72 |
| | 7 | >>72 | 0,72 | 238,72 |

## Conclusion

It is well known that silicone pressure-sensitive adhesives are products of special use. The presented on the poster self-adhesive tapes based on silicone pressure-sensitive adhesives with nanokaolin characteristic good mechanical properties and improve thermally resistance. The best mechanical properties showed of compositions adhesive Q2-7566 with kaolin. The highest maximum temperature work (ca. 246 ºC) obtained composition PSA 590 1,5 wt.% with 7 wt.% content of kaolin. Tape based on silicone PSA with kaolin could be used in heavy industry to combine elements operating at elevated temperature or aerospace bonding solar cells on board satellites and space stations.

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