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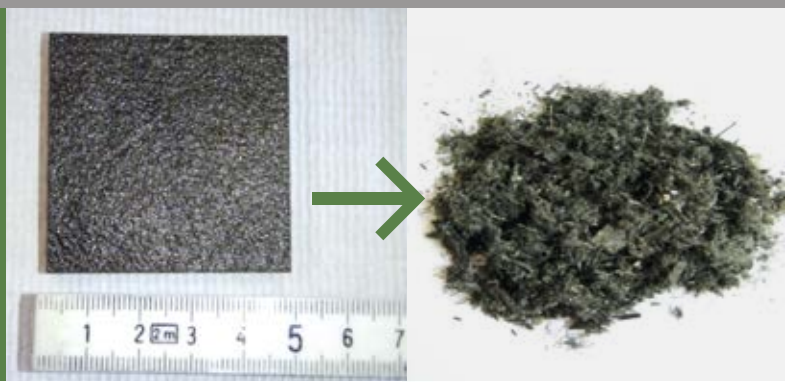

RECYCLING OF CARBONFIBRE REINFORCED POLYMERS FROM AIRCRAFT BY ELECTRODYNAMIC FRAGMENTATION

Objective

Carbon fibre reinforced polymers (CFRPs) are increasingly used to replace metal parts in aircrafts since they combine light weight with high mechanical strength. Modern aircrafts consist of up to 50 per cent of CFRPs. So far the question of CFRP recycling has not been addressed sufficiently.

Current recycling techniques

Currently, the recycling of CFRPs is only possible by energy demanding processes like pyrolysis at high temperatures which allows the regain of carbon fibres or by mechanical grinding methods which can cause a destruction of the fibres and can contaminate the grist by abrasion.

New approach

Mineral composites such as concrete can be separated into its individual components by pulsed power processing. This method also seems to be suitable for organic composites of differing components like CFRPs or metal laminates.

Technology

The physical principle of this technology is based on applying very short (< 500 nsec) high voltage pulses (U = 180 kV, I = 6 kA) to solids in a dielectric fluid like water. The electrical discharges run along phase boundaries in the solid which lead to a disintegration of the composite. One electrical breakdown creates shock waves comparable to a TNT-explosion ($p = 10^9$ Pa) separating the composite material into its components.

The electrodynamic fragmentation is already used in industrial scale e. g. to crush pure quartz for the silicon-wafer industry or to liberate lithium minerals from the surrounding rock matrix. The advantage of the method is the dust and contamination free crushing because abrasion by grinding tools is avoided.

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