

# Recovery of carbonaceous solid residue (char) from coal ash to use as possible substitute graphite-based materials in green energy applications

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## ABSTRACT

The present results were attained under the CHARPHITE project (3<sup>rd</sup> ERA-MIN) whose objective is to demonstrate the feasibility of use char recovered from coal ashes as substitute of graphite-based materials in electro-assisted reactions for energy applications.

The presence of low carbon in coal ash can preclude such application. However, this can be overcome by carbon enrichment. Char recovery methods, involving liquids, other than water, are unsuitable for this purpose as residues are retained in the pores and alter their performance.

Coal ash samples (fly ash, FA, and bottom ash, BA) derived from Poland, Portugal, Romania and South Africa power plants were characterized and the most promising were selected to char concentration trials combining separation methods that were assessed through Fixed carbon on dry basis ( $FC_{db}$ ) or Loss-on-Ignition (LOI).

The combination of sieving, gravimetric and magnetic separation, and gridding resulted in concentrates with 63 wt.%  $FC_{db}$  from the Romanian BA. The carbon recovery using sieving, magnetic separation and a Corona separator provided concentrates from South African FA with 66 % LOI. The sequence sieving, water overflow and magnetic separation resulted in concentrates with 70-80 % LOI for Polish BA and 25 % LOI for

Portuguese FA. For this last sample, was developed a reproducible process which includes sieving, sink-float using water, magnetic separation, impaction and water vortex. This process allowed to increase the carbon grade from 5 to 76 wt.% FC<sub>db</sub>.