Introduction of Hyper-coal

Hyper-coal = Dried and low ash coal

1kg of a black coal and fly ash

1kg of HPC and fly ash
Coal extraction

The molecular associations are thermally loosened and molecules are dissolved into solvent.

Settling (Liquid-Solid Separation)

The solids (ash and insoluble molecules) are settled by gravity in the liquid (solution).

Solvent recovery and recycling

Hyper-coal (solution) and insoluble coal (residue) are obtained after vaporizing the solvent. Recovered solvent is recycled in the process.
Process outline

Solvent recycling
Coal derived
2-ring aromatics

Non use of hydrogen

Simple process &
and Mild conditions
<2MPa, <400 °C

Coal-derivative distillate fractions, mainly methyl naphthalene like compounds, are used for the process solvent. It can be completely recycled in the process.

Hydrogen is an effective material to up-grade low rank coals, but it causes not only to highly plant cost, but also to highly operation cost. Hyper-coal process never uses hydrogen. It brings a simple plant apparatus, mild operation conditions, stable operations and high energy efficiency.
### Ultimate and Proximate analysis

<table>
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<tr>
<th>Coal</th>
<th>Product</th>
<th>ash [wt%]db</th>
<th>VM [wt%] (daf basis)</th>
<th>C</th>
<th>H</th>
<th>N</th>
<th>S</th>
<th>O_{diff}</th>
<th>Fuel ratio</th>
<th>Heat value [kcal/kg] gross</th>
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#### Gieseler plastometry

Thermoplasticity is the most important characteristics for coke strength.

Hyper-coal appeals an excellent thermoplasticity. Significant improvements in the thermoplasticity of coal blends are brought by addition of HPC.

### Hyper-coal (HPC)
- Dried and low ash (<1-2%)
- High heat value (>8500kcal/kg)
- Excellent thermo plasticity
- High storage stability
- High briquettability

### Residual coal (RC)
Residual coal (RC) has high combustibility and high heat value even though the ash is concentrated.
Application as a caking additive

Melting HPC fill the inter particle voids on ahead of coking reactions. It improves thermoplasticity and dilatation of coal blends to be a strong lump coke.

300 kg of coke sample in scale by addition of HPC
Effect as a caking additive

Significant improvement in coke strength is observed by HPC addition, especially with high blending ratio of none or slightly caking coals.

It will bring not only for the cost merit, but also for the expansion in coal application to make blast furnace coke.