ALBEMARLE®

CATALYSTS

DURAZOOM™

Industry-leading olefin and octane enhancement

DuraZOOM additive is the latest in a long line of light olefins and octane enhancers manufactured by Albemarle.

ZSM-5 additives were developed by Mobil Oil Corporation and first used in 1983 as octane enhancers necessitated by the phasing out of tetraethyl lead. Since then, their use has grown enormously worldwide. The initial applications required relatively low levels of ZSM-5 crystal. More recently, the use of ZSM-5 additives has shifted from octane enhancement to propylene generation. This has dictated the need for a much higher crystal content in the additive without degradation in the physical properties, particularly particle strength.

Today, the market for these additives is driven by refiners using the FCC unit to make large amounts of propylene for petrochemicals and plastics. Not only has the concentration of ZSM-5 crystal in olefin/octane additives increased, but the additive concentration in the inventory is also an order of magnitude higher. Currently, refiners regularly use up to 25–30% additive in their inventories.

Maximized propylene and light olefins yields coupled with concerns about weak additive particles exiting the FCC unit and damaging downstream power recovery equipment have led refiners to opt for DuraZOOM.

How DuraZOOM™ works

DuraZOOM contains ZSM-5, which is a 3D pentasil zeolite with a pore diameter of approximately 5.6 Å (Figure 1).

The small pore diameter and channel-like crystal structure allow only linear compounds to enter. Here, they crack on the active acid sites within the crystal. DuraZOOM reacts with naphtha and LCO-range olefinic compounds, and cracks them into C3, C4 and some C5 olefins.

Figure 2 shows the relative shift in naphtha and LPG-range olefinic compounds, sorted by carbon number, through using DuraZOOM. The point at which olefin concentrations begin to increase is dependent on the concentration of C5 and C6 olefins in the gasoline. The rate of cracking of C6 olefins is significantly greater than for C5 olefins with ZSM-5 because ethylene formation is not favored.

DuraZOOM neither cracks nor creates aromatic compounds. Refiners will notice an increased concentration of aromatics in the FCC naphtha. This effect is due to the additive's consumption of naphtha-range olefinic compounds. Refiners may also observe a change in the paraffin concentration in the FCC naphtha. Naphtha-range olefins are known to hydrogen transfer to paraffins, and the decrease in naphtha-range olefins with DuraZOOM usage is likely to decrease the quantity of paraffins formed via hydrogen transfer.

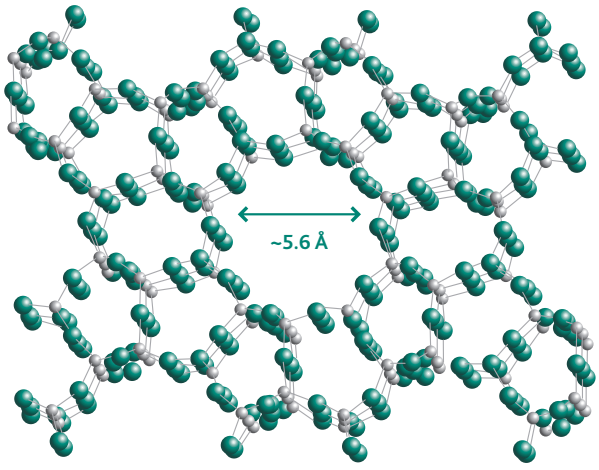

Figure 1: The ZSM-5 crystal structure showing the aligned pore system

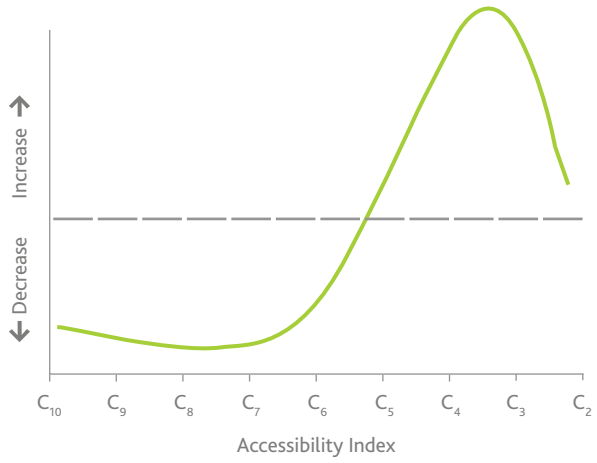

Figure 2: The reactants and products of ZSM-5 catalyzed reaction arranged by carbon number

How octane is increased

Long-chain, naphtha-range olefins generally have low octane values. DuraZOOM selectively cracks these low-octane olefins into propylene, butylenes and isobutene, thereby concentrating the remaining higher-octane molecules and increasing the FCC naphtha-octane value. If there is alkylation capacity at the refinery, the butylenes and isobutane generated by DuraZOOM can be alkylated and blended into the refinery's gasoline pool as a very high-octane, low-sulfur blend component.

Additionally, DuraZOOM facilitates isomerization reactions in naphtha-boiling-range molecules. By increasing branched compounds in the naphtha range, the additive offers an additional method for increasing naphtha octane.

The DuraZOOM™ difference

Since Albemarle entered the market with its K-1000™ additive, significant research and development work has resulted in a more active additive with excellent attrition characteristics. Figure 3 shows the ongoing drive to provide customers with significant improvements in both particle stability and maximum performance.

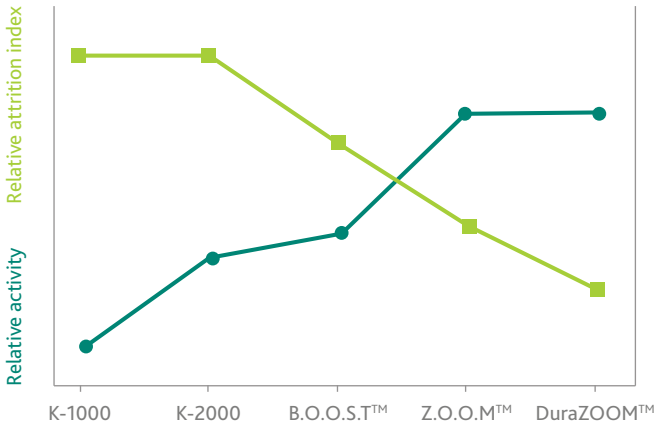

Figure 3: Progressive improvements in activity and attrition resistance over the generations of Albemarle olefin/octane additives

DuraZOOM is the latest breakthrough on both performance fronts. Formulated with a very high concentration of ZSM-5 crystal, it offers unsurpassed attrition resistance.

Test results from several independent laboratories verify Albemarle's claims to DuraZOOM's superior activity and minimum attrition resistance.

DuraZOOM is currently the additive of choice for most FCC units that operate with propylene maximization as their primary goal. It is added at levels as high as 30% of circulating inventory.

Because the relative attrition index of DuraZOOM is lower than that of almost all FCC additives and catalysts sold, those units using higher concentrations of it in the inventory should have less concern about negative effects on downstream power recovery turbine operation.

Furthermore, the excellent attrition characteristics of DuraZOOM pay dividends during its initial use. DuraZOOM can be aggressively base-loaded into the FCC unit to achieve the maximum yield impact in minimum time, which lessens the risk of generating additional particulate emissions from the FCC unit regenerator.

Typical product properties	
Additive name	DuraZOOM™
Application	Olefin/octane enhancement
Attrition index, wt%	1.6
Average bulk density, g/ml	0.71
Surface area, m2/g	120
Particle size distribution (0–40), %	10
Particle size distribution (0–20), %	1

FOR MORE INFORMATION ON THIS OR OTHER ALBEMARLE PRODUCTS AND TECHNOLOGIES, PLEASE CONTACT YOUR ALBEMARLE REPRESENTATIVE.

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