

Purification of High-Purity Monomers and Other Reactive Chemicals

To protect the activity of catalysts used for polymerization, high purity monomers such as ethylene and propylene are treated with specialty adsorbents to remove catalyst poisons, usually traces of oxygenates, or to remove reaction inhibitors.

These monomer treaters can be located in several sites, such as the product exit of the olefin cracker boundary limits, at the wellhead upon withdrawal from salt dome storage, or at the first stage of the polyolefin production plant. Quite often the products are treated with adsorbents at every stage of custody transfer to ensure adherence to specifications.

Other monomers so treated may include styrene, various C4's such as isobutylene or butadiene, and co-monomers such as 1-hexene and 1-octene. The adsorbents used include molecular sieves, beneficiated aluminas doped with various zeolites, and other specific chemisorbents to remove arsines, etc.

Occasionally, little consideration is given to the "inert" adsorbent support media, with disastrous results. All support balls are not equally inert in these environments.

Support balls made from clay (naturally occurring silico-aluminates) by nature contain metal oxides such as iron, titanium, chromium, magnesium, etc. Secondly, some producers have been known to recycle their used kiln refractory and furniture into their clays, adding even more oxides, such as zirconium, to the mix.

These oxides can be considered benign if and only if the ceramic ball is well-fired and the porosity is thus limited. Only then can the oxides be considered sequestered and inactive. Poorly fired ceramic balls can have porosities up to 10%, and some are even deliberately left porous.

As indicated, there have been numerous incidents where inappropriate selection of support balls have taken feed purifiers out of service for extended periods of time. This topic was discussed at a recent olefin technology conference sponsored by the AIChE in San Antonio TX on 23 March, 2010.

In the best case, poorly made balls may contribute to the formation of "green oil", a low-molecular weight highly-viscous polymer that fouls exchangers, valve seats, tower trays, etc. To say green oil is a nuisance is an understatement, it can become a constant operational and maintenance nightmare.

In the worst case, there have been numerous incidents where the support balls caused a polymer mat to form around the support balls under the adsorbent. The pressure drop increases to the point where all flow can and will cease. In one case, the adsorbents were out

of service for over one week to remove and replace the media. The polymer-ceramic ball mat was so durable that jack-hammering was required to remove it.

Recommendations:

- Never use recycled balls in such purifiers, even from your own plant, but absolutely never from an external source. This is a sure way to cause contaminant migration.
- If a ceramic ball is desired, insist on very low porosity, such as our T-38 PROX-SVERS support balls. While transition metal oxides are surely present in the body of the support ball, they are fully sequestered, as evidenced by acid-leachable iron oxides of only 10 ppmw, and leachable sulfates undetectable.
- Demand that the supplier guarantee that no spent refractory or kiln furniture is recycled into the product mix. Be assured, Christy never recycles used refractory into its formulas.
- The best option is to select a high purity alumina ball such as Christy's T-99 PROX-SVERS. The total trace metal oxides rarely exceed 0.5%, mostly soda (Na_2O), but once again, with typical porosity of 0.5%, these oxides are fully sequestered and catalytically inactive.

For many of the same reasons, one should also consider catalytic applications within the olefin cracker, such as selective hydrogenation of acetylene and MAPD, and of methanators, as highly recommended uses for high-purity alumina balls such as T-99 PROX-SVERS.

Christy T-38 and T-99 data sheets are available elsewhere on our website www.christycatalytics.com, or by request. Both T-38 and T-99 PROX-SVERS are marketed globally through a wide network of sales agents and distributors.